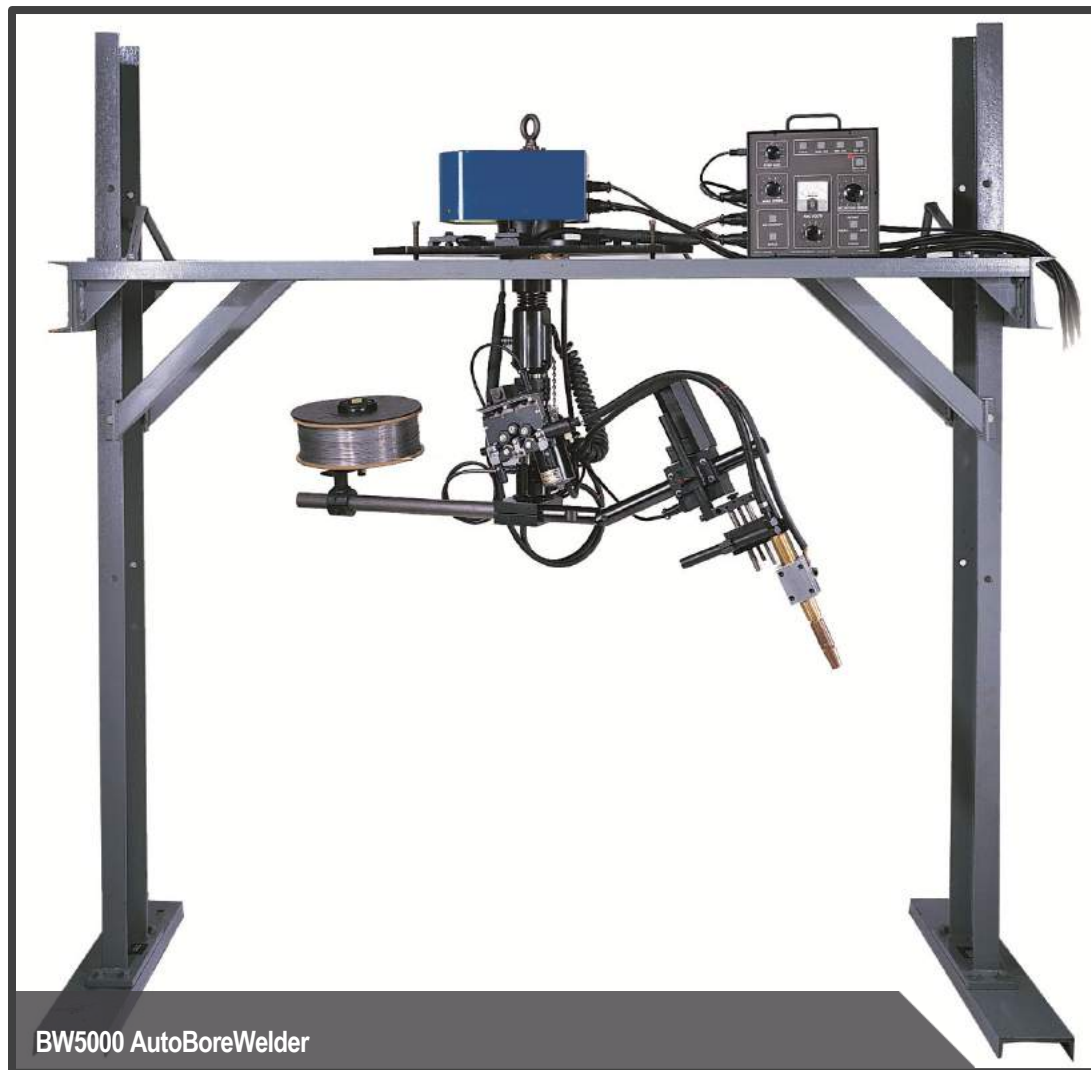


# BW5000

## AUTOBOREWELDER

### OPERATION MANUAL



 **CLIMAX**  
Portable Machining & Welding Systems

P/N 68191  
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Revision 4

 **CLIMAX** |  **BORTECH**  **CALDER**  **H&S TOOL**



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	<p style="text-align: center;"><b>WARNING</b></p> <p>For maximum safety and performance, read and understand the entire manual and all related safety instructions before using this equipment. Failure to follow the instructions and guidelines in this manual could cause personal injury, fatalities or property damage.</p>
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## Safety Precautions

The primary challenge for most on-site maintenance is that repairs are often done under difficult conditions.

Climax Portable Machining and Welding Systems, Inc. leads the way in promoting the safe use of portable machine tools. Safety is a joint effort. As the operator of this machine, you are expected to do your part by scrutinizing the job site and closely following the operating procedures outlined in this manual, your own company rules, and local regulations.

### General Safety Practices

#### **QUALIFIED PERSONNEL**

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Before operating this machine, you must receive training specific to this machine from a qualified trainer. If you are not familiar with the proper and safe operation, do not use the machine.

#### **OBEY WARNING LABELS**

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Obey all warnings and warning labels. Failure to follow instructions or heed warnings could result in injury, or even be fatal. Proper care is your responsibility. Contact Climax immediately for replacement of damaged or lost manuals or safety decals. 1-800-333-8311

#### **INTENDED USE**

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Only use the machine according to the instructions in this operating manual. Do not use this machine for any purpose other than the intended use as described in this manual. When using the tools, machine, accessories and/or tool bits, you must determine the proper working conditions and the work to be performed.

#### **STAY CLEAR OF MOVING PARTS**

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Keep clear of the machine during operation. Never lean toward or reach into the machine to remove chips or to adjust the machine while it is running. Keep bystanders away while operating this machinery.

#### **ROTATING MACHINERY**

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Rotating machinery can seriously injure an operator. Lock out all power sources before you interact with the machine.

#### **KEEP YOUR WORK AREA CLEAN AND TIDY**

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Keep all cords and hoses away from moving parts during operation. Do not clutter the area around the machine. Keep the work area clean and well lit.

#### **AMBIENT LIGHTING**

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Do not operate this machine in ambient lighting that is less than normal intensity.

#### **SECURE LOOSE CLOTHING AND LONG HAIR**

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Rotating machinery can seriously injure an operator as well as others close by. Don't wear loose fitting clothing or jewelry. Tie back long hair or wear a hat.

#### **HAZARDOUS ENVIRONMENTS**

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Do not use the machine in a hazardous environment, such as near explosive chemicals, flammable liquids, gasses, toxic fumes, or radiation hazards.

#### **HOSES, PENDANT AND ELECTRICAL CABLES**

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Do not abuse the pendant cable as this can damage the cable and pedant. Never use the cord for carrying, pulling or unplugging. Remove any and all kinks before straightening the cable. Keep cords and hoses away from heat, oil, sharp edges or moving parts. Plugs must match the outlet. Never modify the plugs in any way. Do not use an adapter plug with grounded power tools. Do not expose the machine to rain or wet conditions. Always examine hoses and cables for damage before use. Be cautious and never drop electrical equipment, this will damage the components.

#### **REPETITIVE MOTION**

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Individuals can be susceptible to disorders of the hands and arms when exposed to tasks that involve highly repetitive motions and/or vibration.

#### **STAY ALERT**

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Stay alert, watch what you are doing and use common sense when operating machinery. Do not operate machinery while you are tired or under the influence of drugs, alcohol or medication.

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## Machine Specific Safety Practices

All aspects of the machine have been designed with safety in mind. Rotating parts are not always shielded by machine components or by the work piece. Do not force the machine.

### **PERSONAL PROTECTIVE EQUIPMENT**

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Eye and hearing protection must be worn while using the machine. These safety items do not impose constraints to the safe operation of the machine.

### **OPERATING CONDITIONS**

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Do not operate the machine if it is not mounted to the work piece as described in this manual.

### **TOOLING**

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The machine is provided with all the tools for the setup and operation of the machine. Remove all adjustment tools before starting the machine.

### **LIFTING**

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Most of the machine components are heavy and must be moved or lifted with approved rigging and practices. Climax accepts no responsibility for the selection of lifting equipment. Always follow your plant's procedures for lifting heavy objects. Do not lift heavy objects by yourself as serious injury can result.

### **CUTTING TOOLS AND FLUIDS**

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There are no cutting or cooling fluids supplied with this machine. Keep cutting tools sharp and clean.

### **CONTROLS**

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The machine controls are designed to withstand the rigors of normal use and external factors. The on-off switches are clearly visible and identifiable. If hydraulic power supply failure occurs, be sure to turn off the supply before leaving the machine.

### **DANGER ZONE**

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The operator and other persons can be anywhere in the vicinity of the machine. The operator must ensure there are no other persons in danger from the machine.

### **METAL FRAGMENT HAZARD**

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The machine produces metallic fragments during normal operation. You should wear eye protection at all times when working with the machine. Only remove fragments with a brush after the machine has stopped completely.

### **RADIATION HAZARDS**

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There are no systems or components on this machine that are capable of producing hazardous EMC, UV or other radiation hazards. The machine does not use lasers nor does it create hazardous materials such as gasses or dust.

### **ADJUSTMENTS AND MAINTENANCE**

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All adjustments, lubrication and maintenance should be done with the machine stopped, and locked out from all power sources. The shut-off valves should be locked and tagged out before performing any maintenance. Do not operate the machine if moving parts are misaligned, binding or broken. If the machine or parts are damaged, have the machine repaired before use.

### **WARNING LABELS**

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Warning labels are already attached to your machine. Contact Climax immediately if replacements are required.

### **MAINTENANCE**

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Be sure the machine components are free of debris and properly lubricated prior to use. Have your machine serviced by a qualified repair person using only identical replacement parts.

### **NOISE LEVEL**

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85 dB(A) or higher – Hearing Protection is required.

### **STORED ENERGY**

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Hydraulic fluids could still be under pressure! Make sure the HPU is shut off and locked out properly.

### **MSDS**

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Material Data Safety Sheets are included in the maintenance manual.

### **UNINTENTIONAL STARTING**

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Prevent unintentional starting. The machine must be properly locked out and/or shut down before maintenance.

## Safety Sign and Symbol Guidelines

The purpose of product safety signs and symbols is to increase the level of awareness to possible dangers.

Safety alert symbols indicate **DANGER**, **WARNING** or **CAUTION**. These symbols may be used in conjunction with other symbols or pictographs. Failure to obey safety warnings can result in serious injury or death. Always follow safety precautions to reduce the risk of hazards and serious injury.

	<p style="text-align: center;"><b>DANGER</b></p> <p>Indicates a hazardous situation that could be fatal or cause serious injury.</p>
	<p style="text-align: center;"><b>WARNING</b></p> <p>Indicates a potentially hazardous situation that could be fatal or cause serious injury.</p>
	<p style="text-align: center;"><b>CAUTION</b></p> <p>Indicates a potentially hazardous situation that could result in minor to moderate injury, damage to the machine or interruption of an important process.</p>
	<p style="text-align: center;"><b>IMPORTANT</b></p> <p>Provides critical information for the completion of a task. There is no associated hazard to people or the machine.</p>
	<p style="text-align: center;"><b>INFORMATION</b></p> <p>Provides important information regarding the machine.</p>

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## Risk assessment and hazard mitigation

Machine Tools are specifically designed to perform precise material-removal operations.

Stationary Machine Tools include lathes and milling machines and are typically found in a machine shop. They are mounted in a fixed location during operation and are considered to be a complete, self-contained machine. Stationary Machine Tools achieve the rigidity needed to accomplish material-removal operations from the structure that is an integral part of the machine tool.

In contrast, Portable Machine Tools are designed for on-site machining applications. They typically attach directly to the workpiece itself, or to an adjacent structure, and achieve their rigidity from the structure to which it is attached. The design intent is that the Portable Machine Tool and the structure attached to it become one complete machine during the material-removal process.

To achieve the intended results and to promote safety, the operator must understand and follow the design intent, set-up, and operation practices that are unique to Portable Machine Tools.

The operator must perform an overall review and on-site risk assessment of the intended application. Due to the unique nature of portable machining applications, identifying one or more hazards that must be addressed is typical.

When performing the on-site risk assessment, it is important to consider the Portable Machine Tool and the workpiece as a whole.



## Risk assessment checklist

Use these checklists as part of your on-site risk assessment and include any additional considerations that may pertain to your specific application.

**TABLE 1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP**

Before Set-up	
<input type="checkbox"/>	I took note of all the warning labels on the machine.
<input type="checkbox"/>	I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
<input type="checkbox"/>	I considered the need for personnel safety guarding and installed any necessary guards.
<input type="checkbox"/>	I read the Machine Assembly instructions and took inventory of all the items required but not supplied.
<input type="checkbox"/>	I created a lift plan, including identifying the proper rigging, for each of the setup lifts required during the setup of the support structure and machine.
<input type="checkbox"/>	I located the fall paths involved in lifting and rigging operations. I have taken precautions to keep workers away from the identified fall path.
<input type="checkbox"/>	I considered how this machine operates and the best placement for the controls, cabling, and the operator.
<input type="checkbox"/>	I evaluated and mitigated any other potential risks specific to my work area.

**TABLE 2. RISK ASSESSMENT CHECKLIST AFTER SET-UP**

After Set-up	
<input type="checkbox"/>	I checked that the machine is safely installed and the potential fall path is clear. If the machine is elevated, I checked that the machine is safeguarded against falling.
<input type="checkbox"/>	I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel.
<input type="checkbox"/>	I planned for containment of any chips or swarf produced by the machine. I followed the maintenance intervals with the recommended lubricants.
<input type="checkbox"/>	I checked that all affected personnel have the recommended personal protective equipment, as well as any equipment required by the site or other regulations.
<input type="checkbox"/>	I checked that all affected personnel understand the danger zone and are clear of it.
<input type="checkbox"/>	I evaluated and mitigated any other potential risks specific to my work area.

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## LIMITED WARRANTY

CLIMAX Portable Machine Tools, Inc. (hereafter referred to as "CLIMAX") warrants that all new machines are free from defects in materials and workmanship. This warranty is available to the original purchaser for a period of one year after delivery. If the original purchaser finds any defect in materials or workmanship within the warranty period, the original purchaser should contact its factory representative and return the entire machine, shipping prepaid, to the factory. CLIMAX will, at its option, either repair or replace the defective machine at no charge and will return the machine with shipping prepaid.

CLIMAX warrants that all parts are free from defects in materials and workmanship, and that all labor has been performed properly. This warranty is available to the customer purchasing parts or labor for a period of 90 days after delivery of the part or repaired machine or 180 days on used machines and components. If the customer purchasing parts or labor finds any defect in materials or workmanship within the warranty period, the purchaser should contact its factory representative and return the part or repaired machine, shipping pre- paid, to the factory. CLIMAX will, at its option, either repair or replace the defective part and/ or correct any defect in the labor performed, both at no charge, and return the part or repaired machine shipping prepaid.

These warranties do not apply to the following:

- Damage after the date of shipment not caused by defects in materials or workmanship
- Damage caused by improper or inadequate machine maintenance
- Damage caused by unauthorized machine modification or repair
- Damage caused by machine abuse
- Damage caused by using the machine beyond its rated capacity

All other warranties, express or implied, including without limitation the warranties of merchantability and fitness for a particular purpose are disclaimed and excluded.

### ***Terms of sale***

Be sure to review the terms of sale which appear on the reverse side of your invoice. These terms control and limit your rights with respect to the goods purchased from CLIMAX.

### ***About this manual***

CLIMAX provides the contents of this manual in good faith as a guideline to the operator. CLIMAX cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.

## Introduction

This chapter contains important safety information, features, product description, basic operation, and specifications. It also describes the parts of the BW5000.

The Climax BW5000 AutoBoreWelder was conceived of and designed by Climax engineering personnel to satisfy the need for a portable machine to have the capability of rebuilding larger bores as well as smaller bores.

Following the introduction of Climax BW3000 AutoBoreWelder, which can work in diameters from 1/2 inch out to 54 inches (12.7 to 1371.6 mm), it became apparent that there was a substantial requirement for a machine which would have diameter capabilities as great as 12 feet (3.75 M). Substantial input from field research and our own technical staff has resulted in the BW5000 which combines ease of use, durability, and high deposition rates in a highly refined product.

Climax manufactures functional welding equipment.

It is the buyer's responsibility to plan for the proper utilization of the equipment, including, but not limited to:

- Developing the procedures to be used; qualifying the equipment operators to the applicable codes and standards.
- Assuring the availability of power and gases at the point of utilization.
- Determining the equipment layout and sequencing for the specific conditions and materials.

Climax can provide assistance in some of these areas, but does not take responsibility for them.

Training courses can be provided onsite and at Climax.

Arrangements must be made in advance, fees may apply.

## Features

The Climax BW5000 AutoBoreWelder (hereafter referred to BW5000) is an automated BoreWelding system with the following features:

- Portable system, allowing large circumferential part buildup without rotating the part.
- Modular “erector set” construction allows multiple configurations to suit varying job requirements
- Wide range capacity, 2 feet to 12 feet (609.6—3657.6 mm) Inside Diameter and Face buildup. Outside Diameter buildup up to 10 feet (3048 mm)
- Heavy duty steel line bars and radial rods
- Feed lengths from 10 to 50 inches, 10 inch increments (254 to 1270 mm, 254 mm increments)
- Variable angle 10 inch (254 mm) stroke feed mechanism for conical seats
- High current limit, 350 Amperes continuous, heavy duty power coupling
- Heavy duty torch mechanism, quick release system
- Reversible 4-roll Wire feed drive for added configurations

- 
- Wire capability from .035 to .062 (0.89 to 1.58 mm) solid, flux or metal core
  - Rotating wire, torch and feed mechanism for added wire tracking consistency
  - Leveling table for simple parallelism adjustment
  - X and Y axis fine adjustment for simple centering adjustment
  - Remote control pendant for management of all welding and operational parameters from one location

## Product Description & Basic Operation

The BW5000 is an automated welding device that consists of a rotating and axially stepping MIG torch system in conjunction with a rotatable power coupling and slip ring system to build up the surface of part.

The BW5000 is designed to MIG weld concentric inside diameters, faces and conical seats from 2 to 12 feet (609.6 to 3657.60 mm) in diameter, up to 60 inches (1524 mm) long, with stroke lengths from 10 to 50 inches in 10 inch increments. Maximum outside diameter capability is 10 feet (3048 mm).

The part remains stationary and the BW5000 is supported from above by a customer supplied frame, which suspends the BW5000 over the parts, providing a solid platform to make necessary parallelism and centering adjustments of the BW5000 axis to the part axis.

Differences in weld diameter are accommodated by the Radial Rod selection, and differences in feed length are accommodated by changes in Auxiliary Slide Guide Rods.

During the setup phase, the operator is required to:

- Set support frame up over the part.
- Install BW5000 on the support frame.
- Parallel and center the BW5000 Line Bar to the part
- Install and adjust the Radial rod, Aux Slide Guide Rod, Aux Stepping Unit, Torch Mechanism, Wire feed Mechanism, Wire Reel support, Cables and Conduits to the BW5000.
- Provide the proper torch/piece clearance.
- Verify clearance of installed parts on BW5000
- Make the initial control settings.

During welding, the operator is required to,

- To start and stop the machine.
- To observe the welding process.
- Make any adjustments in the rotational speed, voltage, wire speed, or step, necessary to maintain good weld quality.

The BW5000 torch support mechanism allows for adjustment of torch to work piece angle and lead/lag variation.


Typical weld mode is spray transfer.

## Safety

The BW5000 welding machine is designed for safety and ease of use in mind. As with operation of any machinery, safe operation depends mainly upon the operator. The BW5000 requires thoughtful, careful operation to produce optimum results and safety. This manual is an important prerequisite in operating the BW5000 safely and effectively.

It is most important that the operator read and understand the specific instructions for set up and operation of the BW5000 found in this manual, keeping in mind the following safety information.

1. Set-up, maintenance, and operation of the BW5000 should only be accomplished by qualified individuals.
2. Alterations to this machine must not be made without written approval from Climax Corporation.
3. Any parts needed for special applications, alterations, repair or servicing must be approved in writing by Climax to avoid creating hazardous conditions.
4. To assure that nothing gets caught in rotating members, avoid wearing loose fitting clothing and keep hair back or in a cap when operating the machine
5. Turn off and lock out all power and release any residual energy sources before changing torches or working on machines. (control, power supply, hydraulic pressure, etc.)
6. Read all instructions for the power supply unit you have chosen to use with the BW5000.
7. Should you have any questions, please call our Technical Service Department at 1-603-358-4030

	<b>CAUTION</b>
	<p>You must use protective eye wear, protective clothing, weld curtains, and shields when using the BoreWelder to protect yourself and others from eye and skin damage. Damage can result from both direct and indirect exposure to arc rays.</p>

## Additional Welding Safety Precautions

1. The operator, and any personnel observing the machine when in use, must wear a protective shield with a filter and cover plates which conform to ANSI Z87.1 Standards
2. The operator should wear protective clothing such as heavy shirts and cuffless pants of a durable flame retardant material for protection from sparks and flame. Other personnel in the area need to be protected from the arc rays by a screen and / or a warning not to watch or otherwise expose themselves to the arc rays or any hot spatter.
3. Practice “good housekeeping” in the area around the BW5000. Keep combustibles or any other fire hazards well away from the work area. Always have the properly rated fire extinguisher readily available.
4. Welding may produce gases and fumes that are dangerous to breathe over prolonged periods. Sufficient ventilation is needed to remove smoke and gases while the machine is in use. The operator should not breathe welding fumes.

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5. Make the electrical installation in accordance with the National Electric code and all local codes where applicable. Also, ground the Control box in accordance with above mentioned codes by powering it only from properly grounded three prong outlets.
  6. Caution must be taken with regard to potentially dangerous electrical shock. Do not ever contact electrically live parts. Your hands can be insulated with dry hole free leather gloves. When working in any damp areas or on metal floors, you must insulate yourself from the ground and the work, making sure you have complete protection if you are sitting or lying on the ground to operate the machine.

To obtain additional details on safety precautions, we highly recommend “Safety in Welding and Cutting”, American National Standard ANSI Z49.1

## Product Features

### Step Process

Step technology allows for complete weld coverage at the start and finish of the bore. Infinite adjustment of step from .070" to .325" (1.78 to 8.26 mm) permits feed to be matched to weld parameters. Precise control of step equals quality and consistency of weld deposit.

### Fully Variable Torch Angle

The design of the BW5000 provides variable torch angle for maximum control of weld puddle. This increases weld bead consistency with a wider range of weld metals and parameters.

### Heavy Duty Torch System

The BW5000 brass body torch enables longer run times and longer consumable life, increasing production and decreasing downtime.

### Wire Feed System

The BW5000 Wire Feed system allows feeding of a wide range of exotic alloys. The modular wire feeder allows multiple configurations, and is reversible for maximum capability.

### Wire / Torch Stickout Adjustment

The Aux Torch Adjuster provides manual fine adjustment of wire stickout,

### Auto Skip (optional)

Auto Skip allows automatic skipping of keyways, (up to 180 degrees of rotation), bidirectional buildup (Pie Mode) of worn areas, or single direction buildup (Carriage Return) of worn areas (under 180 degrees rotation).

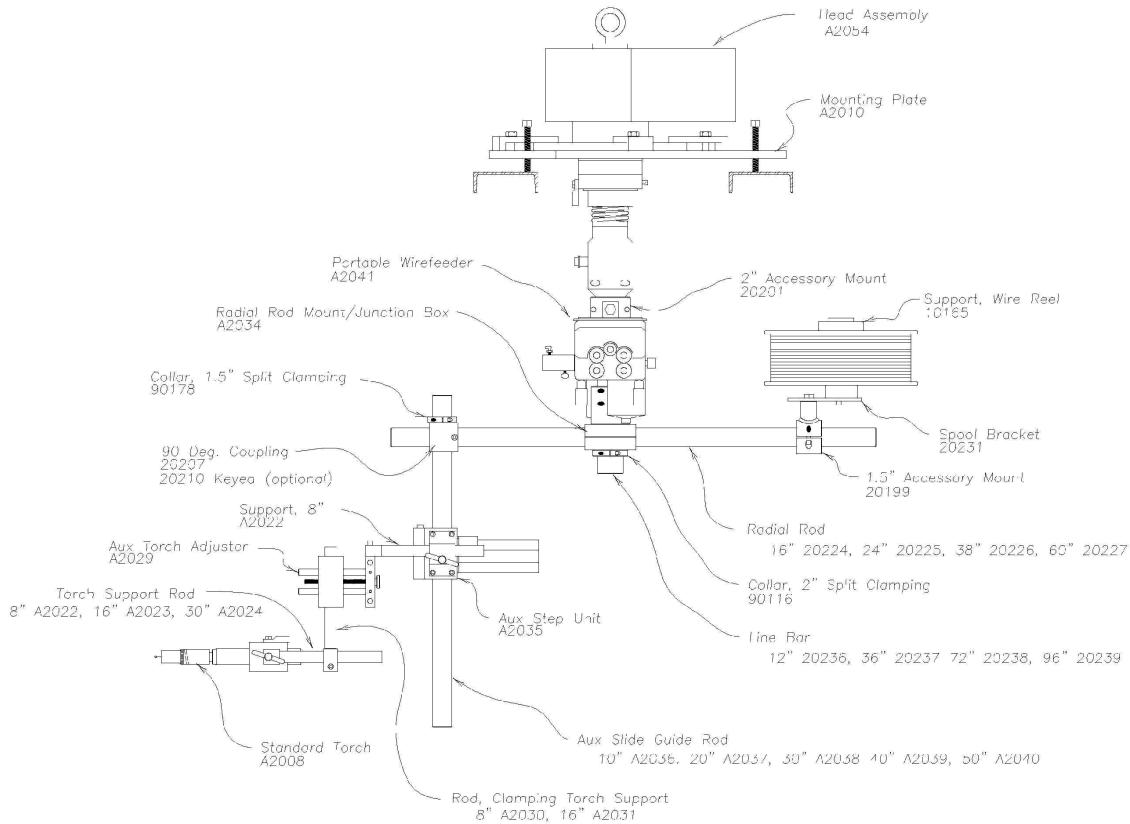
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## Specifications

BW5000 bore/ face range:	2 to 12 feet diameter (609.6 to 3657.6 mm)
Max. outside diameter:	10 feet diameter (3048 mm)
Stroke:	10, 20, 30, 40, 50 inches (254, 508, 762, 1016, 1270 mm)
Weight (head unit):	170 lbs. (77.1 kg)
Current Capacity:	350 amperes 100% duty cycle
Step Range:	.070" to .325" (1.78 to 8.26 mm)
Torch Adjustment:	3 inches of stickout adjustment (76.2 mm)
Weld process:	GMAW / FCAW
Weld Wire capacity:	.035 to .062 (0.89 to 1.58 mm)
Control box power:	110 or 220 VAC 60/50 Hz (internal jumper)



Major Assemblies and Components



Cable, Conduit, and Hose Assemblies

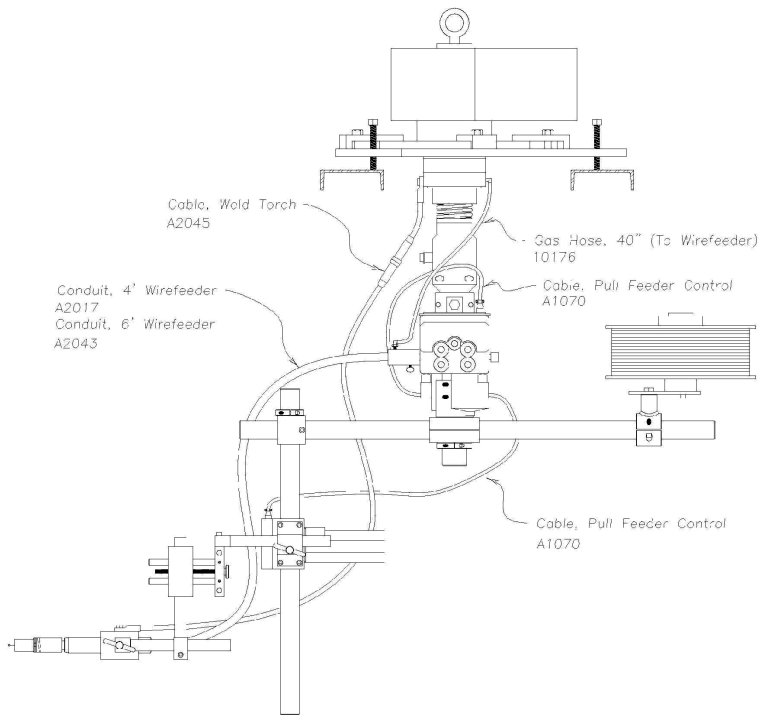


Figure 1 Major Assemblies

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## Major Assemblies

### Mounting Plate

The Mounting Plate provides support for the BW5000, while also allowing for leveling and centrality adjustment.

### Head

The Head provides support and imparts rotary motion to the Line Bar via the Line Bar Coupling. The Head imparts rotary motion to welding current, via Rotating Power Coupling, to Torch. Shielding gas also travels via Rotating Power Coupling to the Wire feeder. The Wire feeder, Step motor and Auxiliary motor current travel from the AMP connectors on the stationary side of the Head, through a series of brushes in the head body, and are terminated at an AMP quick disconnect fitting in the side of the Line Bar coupling at the lower part of the BW5000 head.

### Line Bar

The Line Bar installs into the line bar coupling on the head assembly by means of a taper fitting. Supports and orients the Radial Rod Mount, Radial Rod, and Aux Slide Guide Rod assemblies. The Line Bar comes in 4 lengths, 12" (P/N 20236), 36" (P/N 20237), 72" (P/N 20238), and 96" (P/N 20239). (304.8, 762, 1828.8, 2438.4 mm)

### Radial Rod Mount, Junction Box

The Radial Rod Mount, Junction Box, (P/N A2034) is clamped in any location along the Line Bar and provides a perpendicular attachment point for the Radial Rod. This clamping arrangement allows for the coarse diameter adjustment by movement of the radial rod in the clamp perpendicular to the line bar. The secondary function of this part is an electrical junction box, interfacing with the AMP connector on the Line Bar Coupling. This junction is a central electrical connection point for the wire feeder, step and auxiliary mechanism. The Junction Box also houses the REVERSE / FORWARD switch for the wire feed drive.

### Radial Rod

The Radial Rod provides support to the Aux Slide Guide Rod and Stepping Assembly, via the 90 degree block, (P/N 20207 Plain, P/N 20210 Keyed). The Radial Rods are tapped at each end, for purposes of extending length, or attaching accessories. The 1"-8 NC (25.4 mm) connector used for joining the Radial Rods is P/N 20077. The Radial Rods are available in 16" (P/N 20224), 24" (P/N 20225), 38" (P/N 20226), and 60" (P/N 20227), lengths. (406.4, 609.6, 965.2, 1524 mm) These rods are different lengths for different diameter applications.

### 90° Block

The 90° Block (P/N 20207) attaches the Aux Slide Guide Rod in a perpendicular relationship to the radial rod. The 90° Block, Keyed, (P/N 20210) is used when it is necessary to allow the rack of the Aux Slide Guide Rod to slide through the block.

### Aux Slide Guide Rod

The Aux Slide Guide Rod provides support to and a rack for the Aux Step Unit body and pinion. Provided in 5 different stroke lengths to accommodate varying job requirements, 10" (P/N

A2036), 20" (P/N A2037), 30" (P/N A2038), 40" (P/N A2039), 50" (P/N A2040). (254, 508, 762, 1016, 1270 mm)

## Aux Stepping Unit

The Aux Stepping Unit provides linear movement along the Aux Slide Guide Rod for the Torch Assembly. Once a full rotation is completed, the Aux Stepping Unit will move the value set at the Control Box Step Knob. Step direction can be toggled at the control. The Step unit can be removed and installed on other Aux Slide Guide Rods of different lengths. The Torch attachment point on the Aux Step unit is electrically isolated from the Aux Stepping Unit chassis, and subsequently from the rest of the BW5000. This feature prevents weld current from being shunted to ground through the chassis of the BW5000.

**See Removal and Installation of Aux Step Unit for best practices of removal and installation.**

## Portable Wire Feeder

The Portable Wire feeder installs anywhere on the BW5000 Line Bar or Radial Rod. This capability allows flexibility in placement of the drive mechanism, an advantage when varying job requirements are at hand. To further this advantage, the Wire feeder is capable of being driven in the clockwise or counterclockwise direction, by moving the conduit fitting and inlet guide, then toggling the switch on the Junction Box. Shielding gas enters the wire feed conduit fitting from the Rotatable Power Coupling, via the Gas Hose. The Portable Wire feeder can be installed onto the Line Bar with the 2" (50.8 mm) Accessory Mount (P/N 20201), or onto the Radial Rod with the 1.5" (38.1 mm) Accessory Mount (P/N 20199).

## Wire Feed Conduit

The Wire feed Conduit transmits shielding gas and wire from the Portable Wire feeder to the Torch Body. 27" (P/N A2012), 60" (P/N A2013) 96" (P/N A2014). (685.8, 1524, 2438.4 mm)

## Weld Cable, Torch

The Weld Cable, Torch, shunts weld current from the Rotating Power Coupling directly to the Torch Clamp Body, and Torch. (P/N A2045)

## Torch Assembly

The Torch Assembly (P/N A2008) consists of a brass body with a captive liner held in an aluminum saddle clamp block. A stud on the aluminum block bolts to the Torch Support Rod. The Weld Cable also bolts to this block, transferring weld current to the contact tip through the Torch Assembly. Shielding gas travels through the Torch body to the diffuser from the Wire Feed Conduit.

## Torch Support Rods

There are three types of Torch Support Rods;

**Torch Support Rod**, attaches directly to the stud of the torch mechanism. 8" (P/N A2022) 16" (P/N A2023), 30" (P/N A2024). (203.2, 406.4, 762 mm)

**Torch Support, Clamping**, slides over and clamps to the 7/8" (22.23 mm) diameter of the Torch Support Rod body, 8" (P/N A2030) or 16" (P/N A2031). (203.2 or 406.4 mm)

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**Torch Support, 90°**, attaches to the Torch Body via the stud, but has a 90° bend in its body. (P/N A2033)

## Aux Torch Adjuster

The Aux Torch Adjuster is intended to provide manual stickout adjustment for the Torch Assembly. This assembly is installed between the torch and the step mechanism wherever convenient for the application at hand. A clamping block is supplied with a 7/8" (22.23 mm) diameter hole to receive any of the Torch Support Rods.

## Gas Hose

The Gas Hose connects the output of the shielding gas regulator to the Head of the BW5000 via a quick connect fitting. The Gas Hose is 20' long (P/N A1018). (508 mm)

## Weld Power Cable

The Weld Power Cable transfers weld current from the Weld Power Supply to the non rotating section of the power coupling on the Head of the BW5000. 1/0 Welding cable (P/N A2044)

## Control Cables

The Control Cables connect the Control box all relevant receptacles on the Weld Power Supply and Head Unit. Also, cables connect the rotating AMP connector on the Line Bar Coupling to the Wire feeder, Step Mechanism and Auxiliary Mechanism.

## Weld Power Supply Cables;

<u>Miller 14 Pin</u>	<u>(P/N A1062)</u>
<u>Lincoln 14 Pin</u>	<u>(P/N A1088)</u>
<u>Control to BW5000 Head AutoBoreWelder Cable</u>	<u>(P/N A1074)</u>
<u>Control to BW5000 Head Wire feeder Cable</u>	<u>(P/N A1166)</u>
<u>Line Bar Coupling AMP to Wire feeder Cable</u>	<u>(P/N A1070)</u>
<u>Line Bar Coupling AMP to Step Cable</u>	<u>(P/N A1070)</u>
<u>Line Bar Coupling AMP to Auxiliary</u>	<u>(P/N A1070)</u>

## Control Box

The Control Box provides remote control for all welding functions. The Control drives the Rotation Motor, Step Motor, and Wire feed Motor independently. The Control reads the Step Limit Switch and actuates the Step Motor for the time determined by the Step Knob. The Control Box provides Jog functions for all drive motors to allow swift setup and in process adjustments. The Control box interfaces with Weld Power supplies equipped with remote control, allowing Weld Voltage and Contactor control.


## Power Supply Compatibility Information

Numerous weld power supplies can be used with the BW5000. In order to use the full potential of the BW5000, a minimum continuous welding current of 400 amps should be available (100%

duty cycle). The power supply must be of the constant voltage (CV) type (the type suitable for MIG welding), and it should have remote voltage control capabilities

As mentioned above, the BW5000 comes equipped with a power supply control cable. Consult our Technical Department for information regarding cables not mentioned in this manual.

Attachment of the power supply control cable to the power supply should only be completed by a licensed electrician, and only after a thorough appreciation of the theory of operation of the power supply has been gained by studying this manual and appropriate power supply information.

	<b>WARNING</b>
	If adequate information is not available regarding the operation of the remote contactor circuit of the power supply, do not attempt connection or use until the necessary information is obtained from the manufacture or other reliable source. Improper connection may result in dangerous electrical shock. Damage to the Weld Power Supply or to the AutoBoreWelder Control may result.


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## Receiving the Machine

The machine was run tested and thoroughly inspected before leaving the factory. When leaving the factory, the machine is packaged well for the demands of normal transportation. Climax cannot, however, guarantee the condition upon arrival of the machine.

### Inspecting the Shipment


- Upon receiving your machine inspect the containers for shipping damage.
- Open the containers and inspect the machine for shipping damage.
- Check the items you received against the items listed on the invoice.


	<b>IMPORTANT</b>
	Contact Climax immediately at 1-800-333-8311 concerning damaged or missing components.


### Unpacking Instructions


- When unpacking the machine, take care not to drop or damage the components.
- Use lifting eyes or slings to lift the components out of the shipping crate.
- Save the shipping crate to store the machine when not in use.


### Shipping and Handling Precautions

	<b>WARNING</b>
	Parts can shift and loosen during shipment causing components to fall and drop during rigging causing serious injury or death. Before removing the machine from the shipping container make sure that all tool fasteners / components are tight and secure.

	<b>WARNING</b>
	Falling or uncontrolled swinging of machinery can cause serious injury or be fatal to the operator and bystanders. Lift the machine only by the properly designated lifting points.

	<b>CAUTION</b>
	The containers are designed to be lifted only with the provided lifting points and with the container fully closed. <b>Do Not</b> lift with the container covers removed.

	<b>INFORMATION</b>
	Surfaces subject to corrosion were sprayed with a rust preventative prior to shipment (and possibly wrapped in oil impregnated paper). The user should exercise caution while handling the components provided since they may be greasy and/or slippery.

	<b>WARNING</b>
	<ul style="list-style-type: none"><li>• Do not exceed the rated load limit on the Below-The-Hook lifting device.</li><li>• Do not use the Below-The-Hook device for lifting loads that are not specified in the instruction manual.</li><li>• Do not operate a Below-The-Hook lifting device that is damaged, malfunctioning, or that has parts missing.</li><li>• Do not use a Below-The-Hook device to lift people.</li><li>• Do not make alterations or modifications to a Below-The-Hook lifting device.</li><li>• Do not lift suspended loads over people.</li><li>• Do not leave suspended loads unattended.</li><li>• Stay clear of the suspended load.</li><li>• Do not lift loads higher than necessary.</li><li>• Do not remove or obscure warning labels.</li></ul>

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## Setup of the BW5000

This chapter describes the installation, alignment and initial settings of the control required to ensure successful operation of the BW5000.

### Support Frame

The support frame can be made specifically for the job, (typical for field applications), or a more elaborate frame system may be manufactured for in shop use. While Climax can provide suggestions for the frame, Climax does not manufacture the frame system. See APPENDIX for example.

Position the Support Frame rails relative to the centerline of the bore, as shown in Figure 2

The axial position, or height of the support rails, is determined by the length of the Line Bar to be used, and whether the job is a bore, face or OD weld. For the purposes of this discussion, we will assume a bore is to be welded.

Locate the rails 24 inches (609.6 mm) above the part face. This will give rotational clearance for the BW5000, while also allowing access to the bore.

The support rails should be securely anchored, stable, and capable of supporting the AutoBoreWelder. Any swaying movements must be eliminated by cross bracing.

### Lifting the Head

To lift the BW5000 head, screw the lifting eye into the threaded hole in the spindle located at the top of the BW5000 Head Assembly. The Eye should be screwed into the threaded hole until the eye shoulder bottoms out on the spindle, and then tightened.

The Head and Mounting plate assembly can then be lifted out of the Head Box and set on the Frame Rails. NOTE: Be mindful when lifting the BW5000 out of the Head Box, as there is an AMP fitting, and a weld cable attached to the lower section of the machine. Damage can result if excessive lateral forces are applied to the Head as it is lifted out of the box.



### IMPORTANT

Climax recommends that the lifting eye be left tightly screwed into the spindle at all times while in use.



## Position of BW5000 on Rails

Set the BW5000 down on the rails with two leveling screws on one rail, and the third screw on the second rail. The AutoBoreWelder should be positioned so that the Mounting Plate Assembly / Spindle is approximately central to the bore to be welded—within 1 inch (203.2 mm).

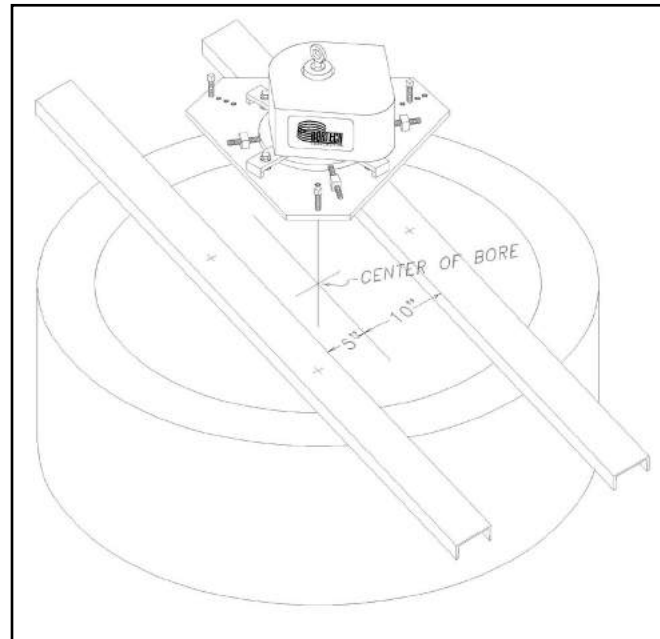


Figure 2 Rail Offset from Center

## Installing Line Bar

Before proceeding with the installation of the Line Bar (2) into the Line Bar Coupling (3), ensure that the two setscrews (1) which hold the Line Bar in place are unscrewed far enough so they do not protrude into the taper area. Use a 1/4 inch (6.35 mm) Allen wrench to turn these screws.

Remove the Safety Pin (4) that is chained to the Line Bar Coupling, and retrieve Line Bar.

Insure that the tapered male and female surfaces of the Line Bar and Line Bar Coupling are free of dirt and grease. Insert the male taper section of the Line Bar into the Line Bar coupling female taper, and immediately install the safety pin into the crosshole. Tighten the Clamping Set Screws that drive the taper together. Do not over tighten, as excessive force can distort the Line Bar taper area.

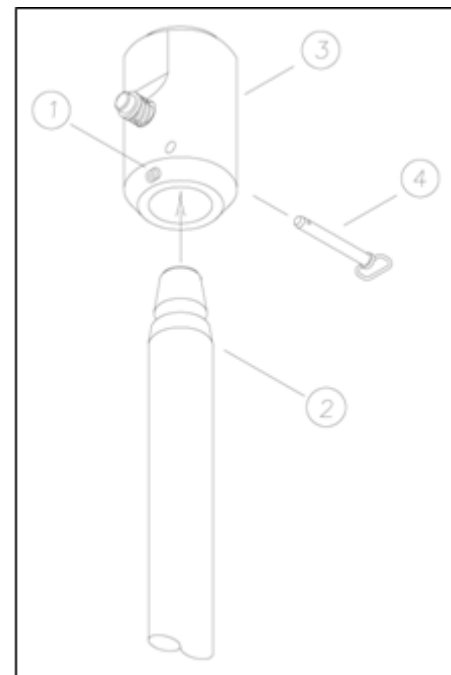


Figure 3 Line Bar & Coupling



## CAUTION

Never operate or move the AutoBoreWelder without the Safety Pin in place.



## IMPORTANT

When lifting the Head / Mounting Plate Assembly, or the Head / Mounting Plate / Line Bar Assembly, ensure that the lifting components are adequately rated and securely attached to the lifting eye.

### Coarse Alignment of the BW5000 Head Axis to the Bore Axis

Consistent BoreWelding depends on the proper alignment of the AutoBoreWelder to the bore to be welded. The Spindle / Line Bar must be parallel to the bore axis (hereafter referred to as Parallelism), and centered in the bore diameter. (hereafter referred to as Centrality).

With a short Line Bar, it is challenging to measure parallelism, as the Line Bar does not extend into the Bore. In these cases, it may be advisable to wait to do the parallelism adjustments until after the Radial rod and Aux Slide Guide Rods have been installed, at which point the BW5000 can be rotated, and referenced to the end of the bore, (assuming there is a perpendicular end to reference on the bore to be welded).

If the Line Bar is long enough to be used as a reference to the side of the Bore, measurements from the bar to the bore can be made, and adjustments to attain parallelism carried out, as shown in Figure 4

“A” Jackscrews are adjusted to attain equal bore surface to Line Bar measurements at the upper and lower sections of the Line Bar, (see lower and upper arrows inside bore surface in the “A” plane)

Repeat the same procedure for the “B” jackscrews, referencing the “B” plane.

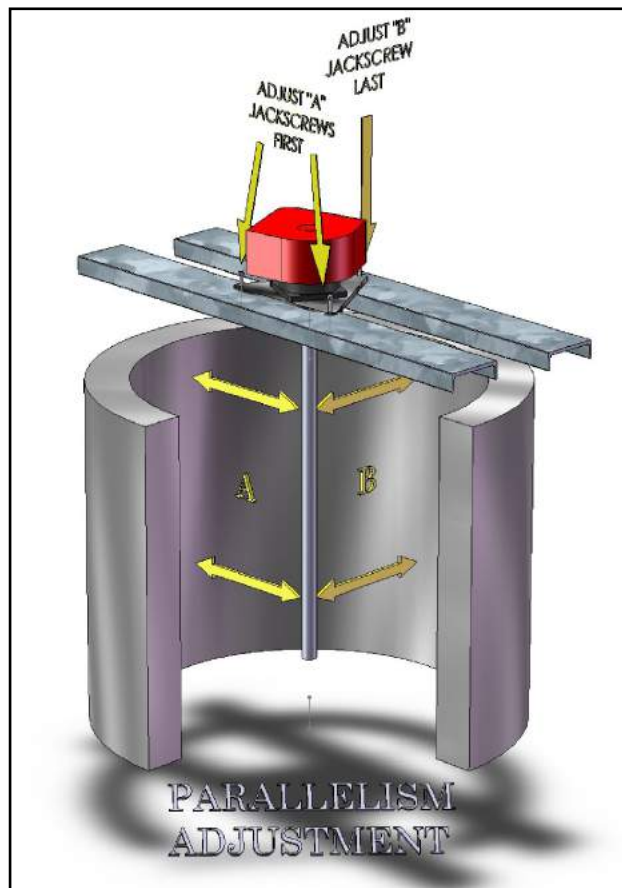


Figure 4 Parallelism Adjustment

## Centering the BW5000 Line Bar to the Bore

Centrality is obtained by utilizing the X-Y table at the top of the BW5000 mounting plate. A tape measure can be used to measure from the Line Bar to the side of the Bore, in quadrants that are aligned to the X-Y table on the BW5000 mounting plate. Make the necessary adjustments to attain equal measurements in each quadrant. Ensure that your centrality measurements are in line with the adjustments provided on the head unit.

## Installing Radial Rod Mount, Junction Box

Retrieve the Radial Rod Mount / Junction Box (2), and the locking collar P/N 90116, plus the appropriate Allen Key to tighten the locking collar. Ensure that the bore of the Radial Rod Mount is clear of foreign material, and verify that the end of the Line Bar is clean and free of dings, spatter, etc. Slide the Radial Rod Mount over the Line Bar, and tighten the clamp screws to lock the mount to the bar. Immediately install the locking collar, P/N 90116, and lock firmly in place underneath the Radial Rod Mount. The locking collar prevents the radial Rod Mount from falling off of the Line Bar inadvertently.

Attach the AMP connector on the heavy black coil cord to the AMP connector on the Line Bar Coupling. (3) (Figure 5)

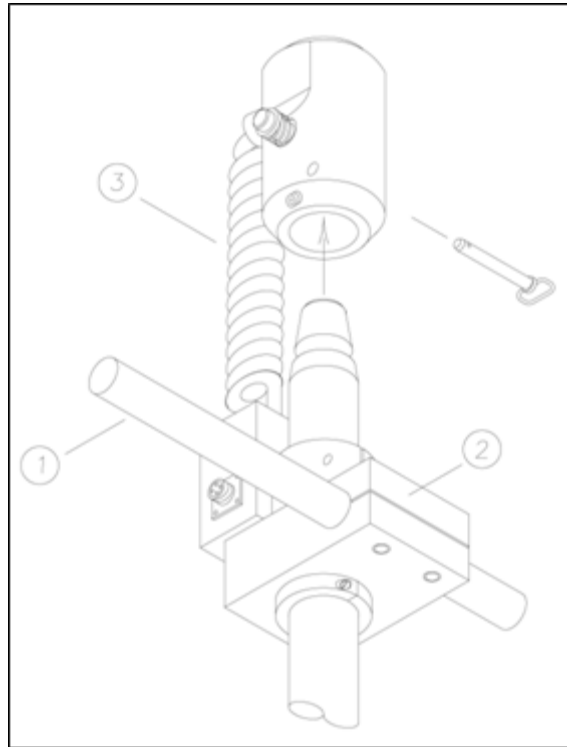


Figure 5 Radial Rod Mount / Junction Box

## Installing Radial Rod

Retrieve the appropriate Radial Rod for the job (1). Choose a Radial Rod that is longer than the radius of the bore, but smaller than the diameter. This way the accessories can be spread out over centerline, for counterbalancing purposes. As with all close fitting parts, make sure the Bar is free of dings and foreign material before inserting the Radial Rod into the bore of the Radial Rod Mount. After installed, tighten radial Rod Clamp on radial Rod Mount (2).

## Installing Aux Slide Guide Rod

Retrieve the Aux Slide Guide Rod and remove grit, foreign material, or dings, from the shaft and rack. Retrieve the 20207 90° Block, install and lightly lock onto the Radial Rod, in such a way that the empty bore is aligned with the bore / machine axis.

Insert the Aux Slide Guide Rod thru the bore of P/N 20207, and immediately install a locking collar, P/N 90178, over the Aux Slide Guide Rod and, to prevent it from falling out of the block if adjustments are to be made later. Next, rotate the Aux Slide Guide Rod until the Step Motor is pointing away from the bore surface. Lightly lock the block to the Aux Slide Guide Rod. (see Figure 6 for orientation view)

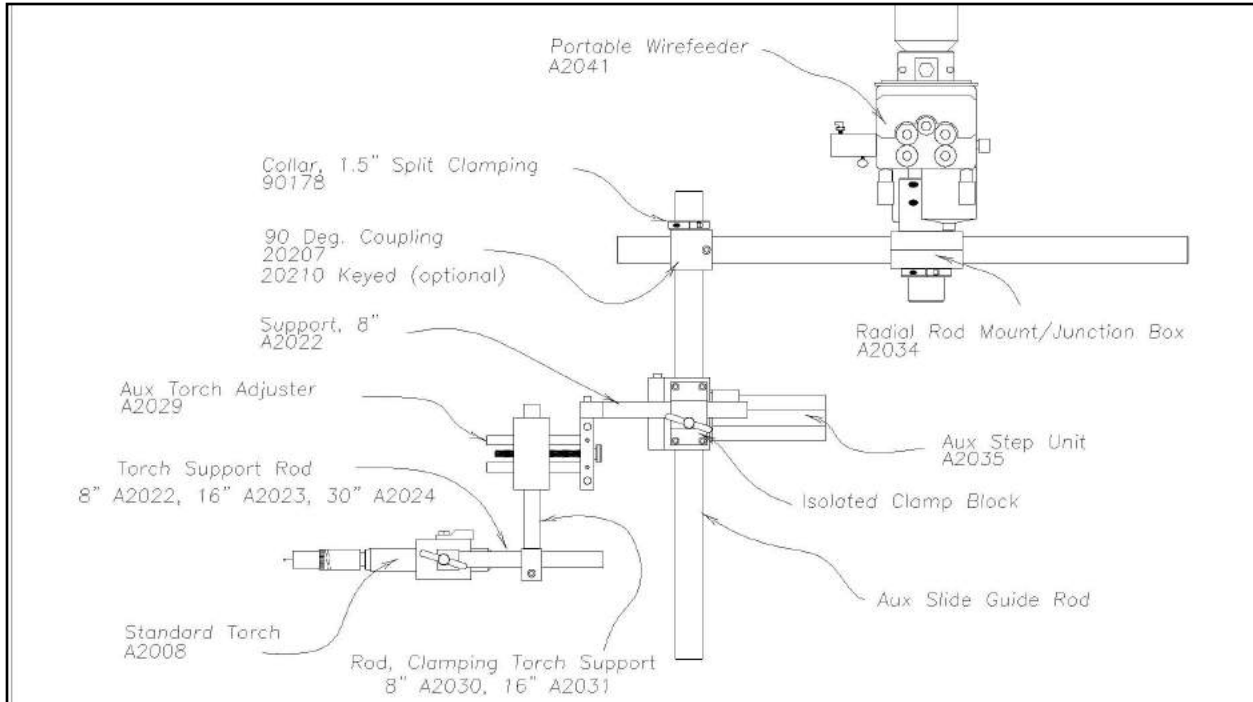




Figure 6 Setup Detail, Bore Application

	CAUTION
	<p>The Aux Stepping Unit uses the rack on the Aux Slide Guide Rod as its "end of travel" limits. Beware that the Aux Slide Guide Rod and related components can collide with Aux Step unit and torch parts before end of limit travel is reached. Proper rigging and subsequent stroke check before welding is advisable to prevent damage to the BW5000.</p>

	CAUTION
	<p>Light oil should be used sparingly to protect the shaft and sliding mechanism. Always wipe off excess oil. Excessive anti spatter or heavy oil compounds can foul the limit system.</p>

## Installation of Torch Support Rod, Adjuster, and Torch

The Torch Support Rods, Torch Adjuster, and Torch are capable of being assembled in different ways, depending on the requirements of the job. In this case, we will focus on a bore application. (see Figure 6)

The Torch Support Rods are affixed to the Aux Step mechanism by means of the Isolated Clamp Block, which is integral to the Step Mechanism. This Clamp Block is electrically ISOLATED from the chassis of the Step Mechanism, and the rest of the BW5000.

**Torch Support Rod** This rod has a block at one end with a clearance hole to accept a 3/8-16 stud / bolt (9.53 mm). There are three available lengths, 8" (P/N A2022) 16" (P/N A2023) and 30" (P/N A2034). (203.2, 406.4, 762 mm)

**Torch Support Rod, Clamping** This rod is designed to clamp onto the Body of the Torch Support Rod. It allows adjustment of the Torch Support Rod in linear and rotational axes. There are two available lengths, 8" (P/N A2030) or 16" (P/N A2031). (203.2 or 406.4 mm)

**90° Angle Torch Support Rod** This rod has a 90 degree bend, to facilitate 90 degree change in direction of orientation or offset requirements. This is available in both configurations, Clamping and Plain.

**Torch Adjuster, (P/N A2029)** The Torch Adjuster is used to make fine adjustments to the Torch to workpiece distance (stickout). This unit installed between the Step Assembly and the Torch. The Torch Adjuster is installed in such a way that its travel direction is perpendicular to the bore surface. While it is possible to utilize the BW5000 without the Torch Adjuster, the benefits generally outweigh the setup time requirements.

Install the Torch support rod into the Clamp Block on the Step Mechanism. Lightly lock Clamp Block wing nut.

Bolt the Auxiliary torch adjuster onto the Torch Support Rod, orienting the slide direction perpendicular to the Bore face, or parallel to the radius.

Install 8 inch (203.2 mm) Torch Support Rod, Clamping, into P/N 20206 Clamping Block affixed to the Aux Torch Adjuster.

## Installation of Torch

Retrieve Torch (P/N A2008), remove wing nut, and install torch onto Torch Support Rod. Set Torch angle to perpendicular, or slightly uphill, in relation to the workpiece. (for spray transfer.) Clearance of the torch to the workpiece should be approximately 1 inch (25.4 mm).

Small adjustments to this combination of Torch and support parts results in a wide range of adjustment in Torch weld diameter, depth, offset, lead, lag, and angle in relation weld process.

After Torch has been attached, connect the lug end of weld cable P/N A-2045 to the aluminum torch body, and the male end quick connect to the female connector at the rotatable power coupling, under the BW5000 head assembly.

## Installation of Wire Feeder and Wire Reel


Utilization of P/N 20199 (1.5" - 38.1 mm) or P/N 20201 (2" - 50.8 mm) Accessory Mount allows placement of the Wire feeder and Wire Reel on the Line Bar or Radial Rod.

When installing these parts, the operator must insure that the combined placement of the Wire feeder and Wire Reel prevent the bare welding wire from contacting any of the Line Bar or Radial Rod components.

The conduit path from the Wire feeder to the Torch should be gradually curved, not convoluted or constricted. Provide clearance for the conduit related to the Torch stepping / travel direction.


The Wire Reel can be placed on the Radial Rod, opposite of the Aux Slide Guide Rod, utilizing the 1.5 inch (38.1 mm) Accessory Mount. This arrangement provides a good counterbalance in large bore applications.

The Wire feeder can be placed on the Line Bar, utilizing the 2.0 inch (50.8 mm) Accessory Mount.

	<b>CAUTION</b>
	The Wire feeder motor or frame must not come in contact with any metal parts of the BW5000. The Wire feeder is directly connected to weld current while welding (via the welding wire). The steel mounting bracket is electrically isolated from the aluminum wire feeder frame.


As the Wire feed Conduit should prescribe a large arc to the Torch, so in certain configurations, it may be advantageous to place the Wire feeder on the Radial Rod, and place the Wire Reel on the Line Bar.

To increase the capability and flexibility of the Wire feed system on the BW5000, the inlet guide and conduit fitting can be reversed, and the switch on the junction box toggled to reverse motor direction.

	<b>CAUTION</b>
	The wire must pay-off straight from the Wire Reel into the Wire feeder, to prevent excessive wear to the inlet guide, or in extreme cases, to prevent bending of the wire.

Adjustments of angle of the Wire feeder are provided by loosening the 1/2-13 (13 mm) bolt that fastens the Wire feeder to the Bar Mount.

The Wire feeder should also be centered in relation to the Wire spools width, and bushings provided can be removed or installed to offset the Wire feeder the correct distance.

	<b>WARNING</b>
	As the bare welding wire is electrically live with weld current while welding, it is especially important that there is ample clearance from the welding wire to any parts of the BW5000. Severe damage can result from shunting weld current to the chassis of the BW5000.

If the setup of the BW5000 prevents a straight line from the Wire Reel to the Wire feeder inlet, it is possible to install a PULL conduit from the Wire Reel to the Wire feeder inlet. Consult Climax for details on this option.

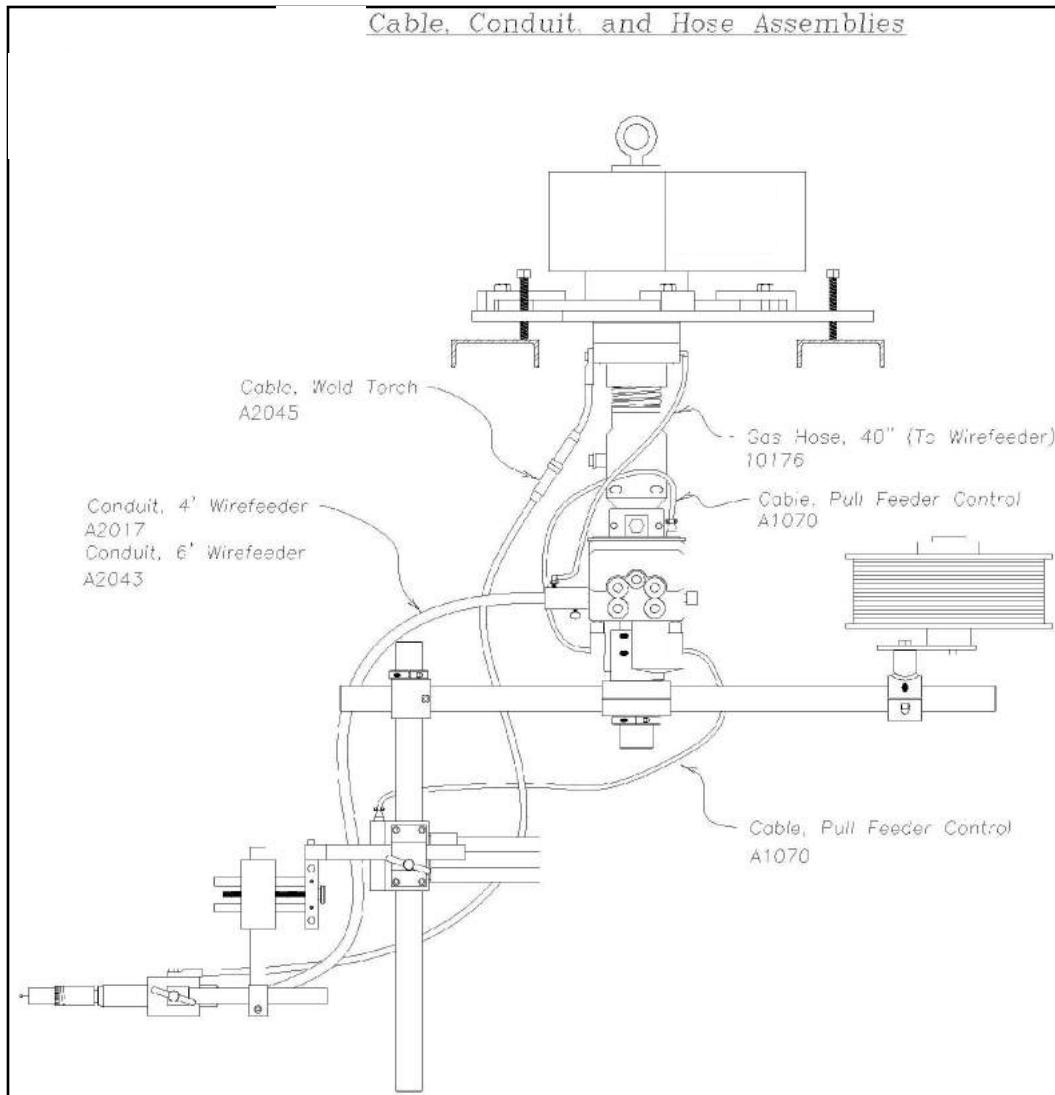


Figure 7 Cable and Hose Assemblies

### Install Conduit from Wire Feeder to Torch.

Ensure that the O-rings are lubricated before installing. Install bullet end into Wire feeder, and tighten wing nut to secure. Install other end into torch, and secure nut by hand only. Avoid using a long conduit whenever possible, creating smooth curves to aid in unrestricted wire feeding. Contact Climax for special length conduits if needed.

### Attaching Wire Feeder Gas Hose

Attach the 40 inch section of 1/4 inch (6.35 mm) rubber hose from the wire feeder nipple at the conduit inlet, to the nipple at the rotatable power coupling. This hose passes the shielding gas from the power coupling to the torch.



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## Attaching Main Gas Hose

The Main gas hose provides the connection between the gas bottle and the BW5000 head. This hose has a quick disconnect fitting for attachment to the BW5000 head, and a standard connection for the regulator.

## Attaching Weld Cables

The Positive weld cable provides a connection between the positive side of the welding power supply to the BW5000 Power Coupling. Insert the female end of the weld cable into the male quick couple at the base of the red shroud of the BW5000 head assembly. Attach the other end to the positive lead of the power supply.

Attach the negative lead to the part, utilizing a clamp or other positive means of attachment. Ensure the attachment point is clean, bare metal, and as close to the welding process as possible. Attach other end of lead to power supply.

	<b>IMPORTANT</b>
	If Climax voltmeter does not work when welding begins, electrically connect the part being welded to the BW5000 stand in order to get weld negative to register at the control voltmeter.

## Attaching Control Cables (Control to Head and Welding Machine Remote)

The Control Box utilizes 3 control cables, and 1 power cable. Plug the labeled end of each control cable into the corresponding receptacle. The control end of cables have “interlocks” which prevent the control from powering up in case of incomplete or incorrect attachment.

The Power Supply control cable interfaces with the weld power supply.

The Wire feed P/N A-1166 and AutoBoreWelder P/N A-1074 cable interface with the receptacles on the side of the red shroud at the top of the BW5000 head.

Plug 110v cable into control and suitable AC power. (see Figure 8)

## Attaching Control Cables, (Junction Box to Wire Feeder and Aux Feed Mechanism)

Attach labeled end of P/N A-1070 cables to Junction Box receptacles Step and Wire feeder. Attach other ends to the Step and Wire feed mechanisms. Insure cables are tucked away to prevent damage by the welding process or movement of Aux Slide Guide.



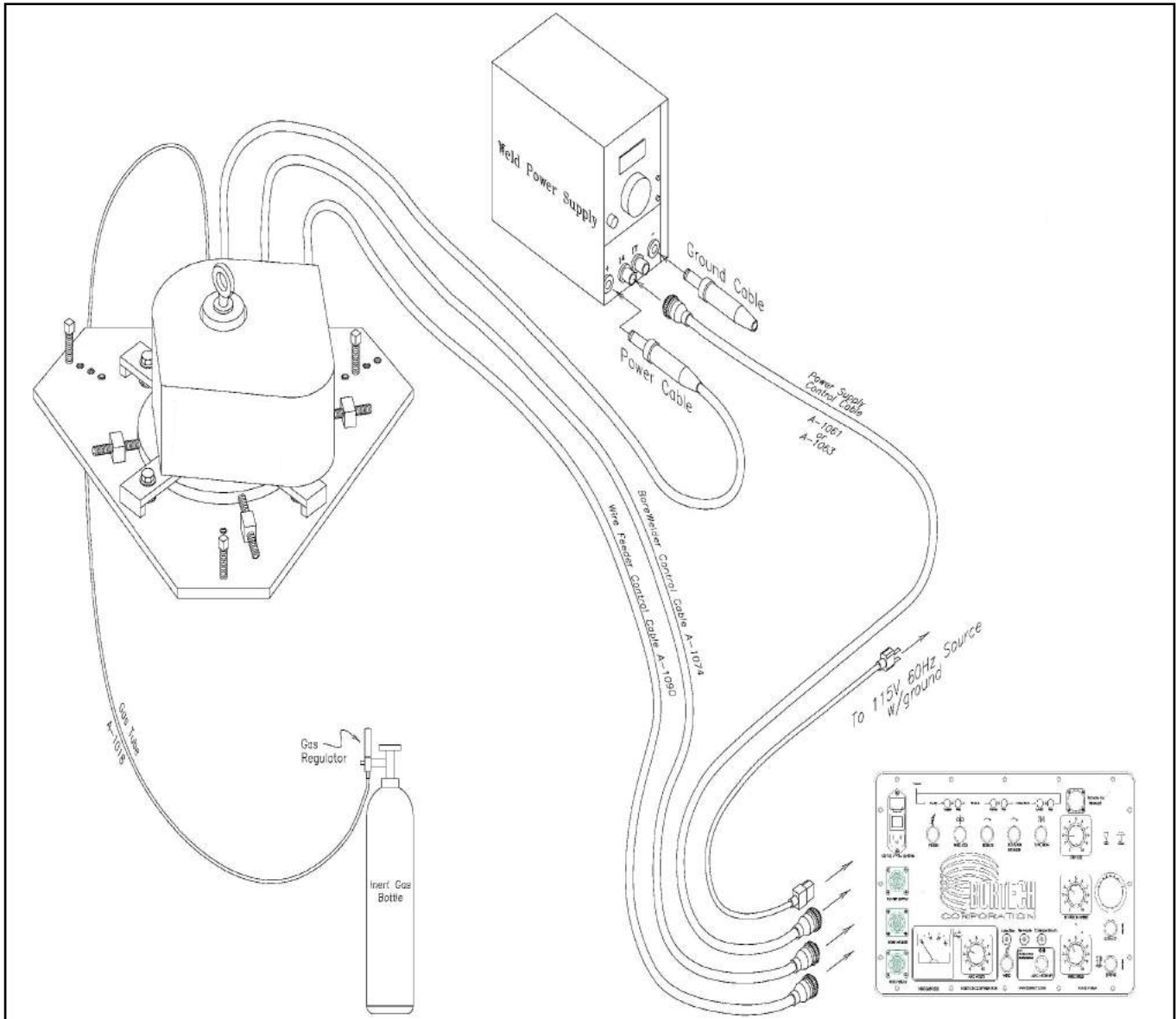


Figure 8 General Schematic

## Powering up Control

The power switch is located adjacent to the AC power inlet.

To power up control, flip rocker switch to the ON position. 1 depressed is on, 0 depressed is off.

The control will take 5 seconds to power up, indicated by illumination of the red AUTO SKIP LED.


If the RED LED does not illuminate, make sure the E stop mushroom head is in its upper position. (twist clockwise to reset).

If all three LEDs flash, one or more cables are not plugged in properly or at all. Check cable connections at control for proper installation.

## Control Functions

The functions of the Climax 160 Control are shown in FIG 9

Check all functions of the Control for operation.

	CAUTION
	Insure that there are no obstructions to any of the moving parts of the BW5000.

- ROTATION (verify operation of Rotation drive)
- ROT INIT (verify operation and location of step switch)
- RETRACT (verify operation of Step Drive)
- EXTEND (verify operation of Step Drive)
- WIRE JOG (verify operation of Wire feed Motor)
- PURGE (Turn Shielding GAS ON verify flow )

After verification of operation and clearances, the final centering adjustments can be made.

FUNCTIONS OF 160 CONTROL			
	Press This Alone	To Do This...	Press <i>with</i> Function Key to...
BUTTONS	Function	Access Second function of a button	
	Purge	Purge Shielding Gas	
	Wire Jog	Jog Wire at Wire Dial Speed Setting	Reverse Jog wire at Dial Setting on control
	Rotate	Jog Spindle at Rotation Dial Speed Setting	Reverse the Rotation direction
	Rotate Init	Jog Spindle to Step point	Check the Step size, Cycle step
	Retract	Retract Jog of Step mechanism	Turn on and off Step function
	Extend	Extend Jog of Step mechanism	Reverse Step direction
	Weld	Start Welding, Stop Welding	Cycle through Auto Skip, Pie Mode, Carriage Return
	Arc Interrupt	Stop Welding, but maintain Rotation.	Disable Auto Skip Function (BLUE LED OFF)
	Emergency Stop	Disconnect from Mains Power	
KNOBS	Step Size	Sets Step Size from .070" to .325"	
	Rotation Speed	Sets Rotation Speed from 2' to 12' bore range ("0" biggest Bore / "10" smallest bore)	
	Wire Speed	Sets Wirespeed from 0 to 750 Inches per Minute (IPM)	
	Voltage	Remotely Controls Weld Power Supply Arc Voltage	
LIGHTS	AUTO SKIP	RED when Auto Skip is ON (Skip the CAM DETENT)	
	PIE MODE	BLUE when Pie Mode is ON (Weld Bi-directionally inside Cam Detent)	
	CARRIAGE RETURN	GREEN when Carriage Return is ON (Weld in programmed Rotation direction inside Cam Detent, fast return to weld in)	
	ARC INTERRUPT	BLUE WHEN AUTO SKIP IS ON, OFF WHEN AUTO SKIP IS OFF	
METER	ARC VOLTMETER	Reads Arc Voltage at Borewelder Head when machine is welding	

Figure 9 Functions of 160 Control

## Final Centering

For rapid and final centering of the BW5000, utilize ROT JOG to move the spindle assembly and all attached components through the 4 quadrants that relate to the X and Y adjustment table on the BW5000 base plate.

For purposes of this manual, let us assume that the X axis adjustment moves the head unit in a left / right direction, or between 9 and 3 o'clock, and the Y axis moves the head toward and away from us, or between 6 and 12 o'clock.

1) Start with the "X" axis, and rotate the spindle to the 9 o'clock quadrant, note the distance from the torch to the part, then rotate the spindle 180° opposite, to the 3 o'clock quadrant, and note the distance torch to the part. Adjust the X axis one half the difference of the distance between the two points.

2) Next, move to the Y axis, starting at the 6 o'clock quadrant, note the distance from the torch to the part, then rotate the spindle assembly 180° opposite, to the 12 o'clock quadrant, and note the distance from the torch to the part. Adjust the Y axis one half the difference of the distance between the two points.

Centering within 1/8 to 1/16 inch is acceptable in most cases.

## Feeding Welding Wire to the Torch Mechanism

Install the welding wire on the reel support, clip, and straighten 6 to 8 inches (152.4 to 203.2 mm) of wire, open the feed roll pressure mechanisms, and insert the wire through the feed mechanism. Be sure that the feed rolls are the correct size for the wire being used.

The feed roll size is stamped on the outside of the feed roll, yet the groove in use is the lower groove, as viewed by the operator. When closing the pressure roll mechanism, be sure that the wire is seated in the groove.

Press WIRE JOG to feed wire through the system to the torch. If too much wire is fed, the keystroke FUNCTION-WIRE JOG will retract the wire. However, the wire reel does not run backwards, so the operator will have to take up the slack if reverse wire jog is used for more than 2 inches (50.8 mm) of retraction distance.

FEED ROLL SIZES			
P/N	METRIC SIZE	STD SIZE	GROOVE TYPE
20198	1.4MM-1.6MM / 2.0MM-2.4MM	.052-.062 / .078-.094	KNURLED V-GROOVE
20172	1.0MM-1.2MM / 1.4MM-1.6MM	.039-.045 / .052-.062	KNURLED V-GROOVE
20171	1.6MM / 1.2MM	.045 / .062	U-GROOVE
20117	1.2MM / 1.6MM	.045 / .062	V-GROOVE
10655	.8MM / .9MM	.030 / .035	U-GROOVE
10630	1.0MM / 1.2MM	.039 / .045	V-GROOVE
10566		.045-.052 / .062	KNURLED V-GROOVE
10565	.8MM-.9MM	.030-.035	KNURLED V-GROOVE
10564	1.0MM-1.2MM	.039-.045	KNURLED V-GROOVE
10435			BLANK PRESSURE ROLL
10278	1.0MM-1.2MM	.039 / .045	U-GROOVE
10233	.9MM / 1.2MM	.035 / .045	V-GROOVE

Figure 10 Feed Roll Sizes

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## Welding Power Supply Wettings

Make sure the Weld Power Supply is in the “REMOTE CONTROL” position, if applicable, to insure complete command of the remote voltage control and contactor circuits.

## Final Control Adjustments

Consistent setting of Rotation speed allows repeatable results regardless of bore size.

Rotation Speed is dependent on Bore size and Travel Speed of the weld process. Travel speed is the linear movement speed of the torch along the Bore surface, measured in Inches Per Minute. (IPM)

The operator is required to make a calculation regarding his intended Travel Speed, related to the Bore size to be welded in.

MIG Spray transfer Travel Speed target is 10 IPM to 25 IPM.

MIG short arc Travel Speed target (in the horizontal welding plane), can range from 18 to 22 IPM.

To accurately set Rotation speed, reference Figure 11 “Travel Speed Constants” Multiply the Bore size in inches by the Seconds per Inch of Diameter.

For example, welding at 16 IPM travel speed, with a Bore size of 57 inches, take the Seconds Per inch of diameter value, “11.7” x 57 = 666 seconds, or 11 minutes per rotation.

Adjust the Rotation speed dial to a coarse setting, then hold Rotation Jog and time the spindle for one revolution. Make necessary changes to the Rotation speed Dial to attain the proper parameter.

To speed up the process, the time can be measured in 1/4 of the bore, to prevent waiting for the spindle to move for one complete revolution.

## Quick Tip

Another method, slightly less accurate but faster, is to mark a 1 inch long linear section of the Bore in an area where the torch traverses during rotation. This 1 inch space will be used as a timing gate, or marker.

Refer to Figure 11 “Travel Speed Constants”, showing “SECONDS TO TRAVEL ONE LINEAR INCH.

EXAMPLE: At 20 IPM travel speed, the torch takes 3 seconds to travel 1 linear inch. This is a preferred method for quickly roughing in the rotation speed.

For more accuracy in this timing method, increase the length to 5 inches, and make the necessary changes to the time constant.



		TRAVEL SPEED (INCHES PER MINUTE) IPM						
		10	15	20	25	30	35	40
DIAMETER (INCHES)	20	376.80	251.20	188.40	150.72	125.60	107.66	94.20
	25	471.00	314.00	235.50	188.40	157.00	134.57	117.75
	30	565.20	376.80	282.60	226.08	188.40	161.49	141.30
	35	659.40	439.60	329.70	263.76	219.80	188.40	164.85
	40	753.60	502.40	376.80	301.44	251.20	215.31	188.40
	45	847.80	565.20	423.90	339.12	282.60	242.23	211.95
	50	942.00	628.00	471.00	376.80	314.00	269.14	235.50
	55	1036.20	690.80	518.10	414.48	345.40	296.06	259.05
	60	1130.40	753.60	565.20	452.16	376.80	322.97	282.60
	65	1224.60	816.40	612.30	489.84	408.20	349.89	306.15
	70	1318.80	879.20	659.40	527.52	439.60	376.80	329.70
	75	1413.00	942.00	706.50	565.20	471.00	403.71	353.25
	80	1507.20	1004.80	753.60	602.88	502.40	430.63	376.80
	85	1601.40	1067.60	800.70	640.56	533.80	457.54	400.35
	90	1695.60	1130.40	847.80	678.24	565.20	484.46	423.90
	95	1789.80	1193.20	894.90	715.92	596.60	511.37	447.45
	100	1884.00	1256.00	942.00	753.60	628.00	538.29	471.00
	105	1978.20	1318.80	989.10	791.28	659.40	565.20	494.55
	110	2072.40	1381.60	1036.20	828.96	690.80	592.11	518.10
	115.0	2166.60	1444.40	1083.30	866.64	722.20	619.03	541.65
120	2260.80	1507.20	1130.40	904.32	753.60	645.94	565.20	
125.0	2355.00	1570.00	1177.50	942.00	785.00	672.86	588.75	
130	2449.20	1632.80	1224.60	979.68	816.40	699.77	612.30	
135.0	2543.40	1695.60	1271.70	1017.36	847.80	726.69	635.85	
140	2637.60	1758.40	1318.80	1055.04	879.20	753.60	659.40	
145.0	2731.80	1821.20	1365.90	1092.72	910.60	780.51	682.95	

SECONDS PER ROTATION

TRAVEL SPEED CONSTANTS		
INCHES PER MINUTE (IPM) TRAVEL SPEED	SECONDS PER INCH OF DIAMETER	SECONDS TO TRAVEL ONE LINEAR INCH
10 IPM	18.84	6 seconds
12 IPM	15.7	5 seconds
14 IPM	13.4	4.3 seconds
16 IPM	11.7	3.75 seconds
18 IPM	10.4	3.3 seconds
20 IPM	9.4	3 seconds
22 IPM	8.4	2.7 seconds
24 IPM	7.8	2.5 seconds

Figure 11 Seconds Per Rotation and Travel Speed Constants

## Wire Speed Adjustment

The Wire speed should be set to a approximate value before welding. Final adjustments are made after welding begins, to attain intended amperage values. (If an ammeter is present in Weld Power Supply)

Utilizing the chart below, choose your wire size, determine approximate starting amperage, and note approximate Inches Per Minute (IPM) value. To measure the wire speed precisely, hold down the Wire Jog button for 6 seconds, then measure the wire that exits the tip in this period. The result multiplied by 10 equals Inches Per Minute (IPM) of Wire speed.

Make necessary adjustments to the Wire speed knob to attain your specific Wire speed value.

Example: 6 seconds of wire jog equals 32 inches of wire passed.  $32 \times 10 = 320$  IPM. (812.8 mm x 10 = 812.8 cm Per Minute)

See Figure 12 below for approximate amperage values.

AMPERAGE VS. WIRESPEED APPROXIMATE VALUES (GMAW SOLID WIRE)			
IPM WIRE SPEED	.035 DIA. WIRE	.045 DIA. WIRE	.062 DIA. WIRE
100 IPM	59 AMPS	97 AMPS	185 AMPS
150 IPM	90 AMPS	150 AMPS	275 AMPS
200 IPM	114 AMPS	189 AMPS	350 AMPS
250 IPM	130 AMPS	215 AMPS	410 AMPS
300 IPM	140 AMPS	230 AMPS	440 AMPS
350 IPM	160 AMPS	265 AMPS	490 AMPS
400 IPM	180 AMPS	300 AMPS	560 AMPS

Figure 12 Amperage vs Wire Speed

## Step Adjustment

Step, or axial feed per revolution is dependent on Torch Travel speed and Wire speed. Step must be estimated before welding, and then set accurately after the weld process is started. Visual verification of the weld bead laying directly at the intersection of the previous bead and base metal is required for successful BoreWelding.

To estimate step, (@ 20 IPM travel speed), current is nearly equal to step in thousandths of an inch.

To cycle step while not welding, utilize keystroke FUNCTION-ROT INIT.  
To reverse step direction, utilize keystroke FUNCTION-RETRACT.

To shut Step off, utilize keystroke FUNCTION-EXTEND.

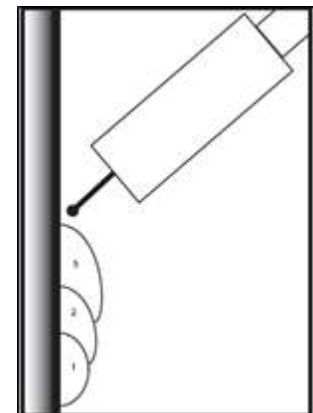


Figure 13 Step Location

## Rotate Start Point

Depressing the ROT INIT button will rotate the spindle to the step point. This is the most advantageous location to begin the weld process.

## Axial Torch Adjustment / Start Point

Jog the Torch axially to the desired start location. The welding wire can be utilized as a pointer to determine the exact location of the weld bead. Typical axial starting point is 1/8 to 3/16 from the bottom of the bore, depending on starting weld parameters.

## Utilizing Auto-Skip Option (if equipped)

Auto Skip is, first, a way to automatically skip keyways. However, with a quick keystroke, the Auto Skip system lets you fill in an out-of-round or worn section of a bore.

This function greatly increases productivity, as you can fix a worn section of the bore without excessive pre-machining and subsequent BoreWelding to fill in the over-bored area.

The skip area is programmed using two cam disks on the top of the AutoBoreWelder, described below:

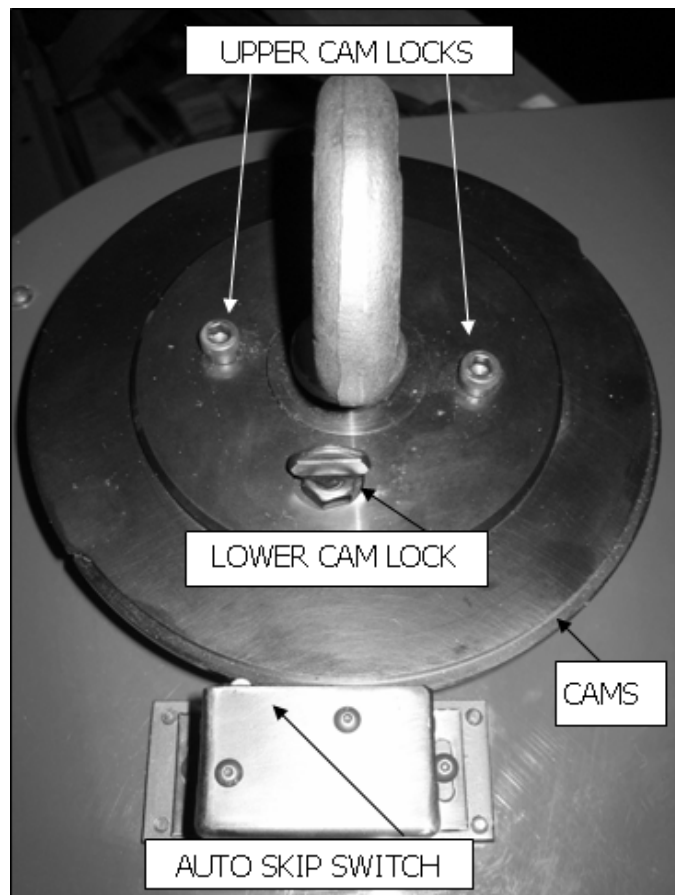


Figure 14 BW5000 Auto Skip

1. Make sure the BW5000 AutoBoreWelder is centered and parallel to the bore.
2. Rotate the torch by pressing the ROTATE button. Rotate to the beginning of the “interrupt”, or weld area.
3. Loosen the Upper and Lower Cam locks, then move discs in opposite directions to open a low area, or “detent” in the cam discs.
4. Rotate the discs until the AUTO SKIP switch just falls into the low area. (that is, the switch rides off of the “high” entering the low “interrupt” area). Ensure that the detent is on the correct side of the Auto Skip Switch. A mental note of the rotation direction helps to insure that the detent will be phased correctly to the Auto skip area.
5. Lock the lower cam disc with the lower cam lock.
6. Rotate the torch, as in step 2, to the end of the interrupt area. Then move the other cam disc to just actuate the Auto Skip Switch (that is, the switch rides up on the “high” leaving the low “interrupt” area).
7. Recheck settings, and verify accuracy of cam settings before utilizing the machine.



## IMPORTANT

The lifting ring in the center of the Auto Skip disc assembly **MUST** always be tight for safety reasons. This also fastens the Auto-Skip cam assembly in position.

### To Use Extended Functions of Auto Skip, “Pie Mode” and “Carriage Return”

The 160 control provides two more options for extended use of the Auto Skip Cams. To switch functions, hold down the FUNCTION key and press the WELD button while NOT in weld mode. See Figure 15 below.

To switch from Auto Skip (the default power up setting) to Carriage Return, hold down the FUNCTION key and press the WELD button twice.

To go from Carriage Return to Auto Skip, hold down the FUNCTION key and press the WELD button once.

#### Pie Mode

Pie mode is used to weld up worn areas of bore in the vertical axis.

The following procedure assumes you have just powered up the control and are in the Auto Skip mode.

##### To use Pie Mode:

1. Set up the AutoBoreWelder as described previously.
2. Set the Auto Skip cams as if you were going to skip the worn section.
3. While you are not welding, hold down the FUNCTION key and press WELD once (to cycle from Auto Skip to Pie Mode).
4. Resume welding as you would for normal BoreWelding. The AutoBoreWelder will now weld back and forth inside the worn area, stopping the weld process, stepping, then beginning weld again in the opposite direction at each end point. The weld parameters are controlled exactly the same as for normal BoreWelding.

#### Carriage Return

Carriage Return is used to weld up a worn area of a bore in the horizontal axis, when the worn section occurs on the uphill or downhill side of the bore.

The following procedure assumes you have just powered up the control and are in the Auto Skip mode.

##### To use Carriage Return:

1. Set up the AutoBoreWelder as described previously.
2. Set the Auto Skip cams as if you were going to skip the worn section.
3. While you are not welding, hold down the FUNCTION key and press WELD twice (to cycle from Auto Skip to Carriage Return).



4. Set the rotation direction to the preferred weld direction for your application by holding down the FUNCTION key and pressing the ROTATE button to toggle the rotation direction.
5. Resume welding as you would for normal BoreWelding. The AutoBoreWelder welds in the rotation direction inside the worn area, until it reaches the end of the set cam limit. It then stops welding and reverses rotation at full speed to the original starting point while stepping. The weld and rotation begin again. All parameters are set as you would with normal BoreWelding.

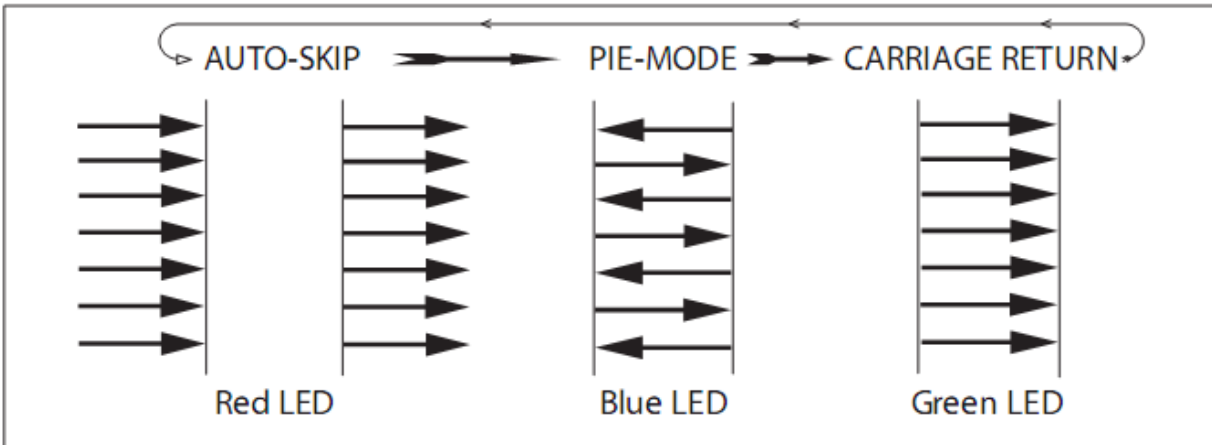


Figure 15 Functions of Auto Skip

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## Operation of BW5000

This chapter describes the operation of the BW5000, including welding pointers and tips.

### Pre Weld Checklist

In order to provide a smooth start to welding, utilize the following checklist;

- Turn on Shielding Gas and check flow rate by depressing PURGE on control. Set flow rate to 30 cfh
- Verify that gas hose from power coupling to Wire feeder is connected and free of kinks and obstructions.
- Verify Weld Power Supply is on and set correctly.
- Check Positive and Negative weld connections at Welder, BW5000, and part to be welded.
- Verify connection of positive weld cable from Power Coupling to Torch.
- Verify Rotation speed is set
- Verify Wire speed is set
- Verify Step is set
- Verify Voltage is set
- Verify ROT INIT position is set
- Verify axial position is set
- Verify wire is at tip and wire feeder pressure rolls are closed

### Starting and Stopping the Weld Process

To start the weld process, push the WELD button once.

To stop the weld process, push the WELD button again.

### Initial Adjustments

Initial adjustments when welding begins include Voltage, to stabilize the process if needed, and Wire speed to fine tune the amperage if required. Step size accuracy will need a visual verification after the first step, and further adjustments as any wire speed changes are made.

### Retracting and Extending During Weld Process

The control box has two retract speeds, JOG mode and WELD mode.

In WELD mode the speed is 1/3 that of JOG mode, and can be used while welding.

If immediate adjustments need to be made while welding, the operator can move the torch up and down with EXTEND / RETRACT buttons.

## Arc Interrupt

The Arc interrupt function is utilized to stop the welding process manually (while maintaining rotation and step function).

This is a momentary type switch, therefore the operator needs to hold it down to maintain the interrupted arc. This function can be activated remotely by the Remote Arc Interrupt Cable.

## Welding Pointers

**RUNTIME:** The length of time that the AutoBoreWelder will weld continuously is largely dependent on the spatter buildup in the welding nozzle. To that end, when choosing wire, gas and power supply combinations, look for a combination that will produce the smoothest and least violent arc action, reducing spatter buildup on the nozzle, improving runtime in long buildup applications. It should be possible to run a 33 or 44 pound (15 or 20 kg) spool non-stop in spray mode.


**STARTING:** When high currents are to be used, as with high deposition overlay, a strategy must be employed to prevent the molten puddle from “spilling” during the first revolutions of welding.

As the first revolution is made, the weld bead must be smaller than the following beads, as there is no support for this first bead. As the second rotation is started, the wire speed and voltage can be increased, as there is support for the second bead. By the third or fourth rotation, full current values can be attained.

In these first three rotations, (or any time step adjustments need to be made) step adjustments are made in advance of the coming step point, then wire speed adjustments made during or after the step point. In this way, all adjustments happen directly at the step point, providing clean transition to the weld beads.

**SPRAY TRANSFER:** When utilizing spray transfer, it may be necessary to weld the first rotation in short arc mode with a lower current and shorter step in order obtain a shelf to support subsequent beads. Welding with too high a current too quickly can result in undercutting of the base metal, loss of control of the weld puddle, causing the weld bead to be uncontrollable. (graping, undercutting, poor bead shape).

The shape of the bead being applied is also dependent on the bead of the previous rotation. Therefore expect a 1 to 3 rotation lag time before parameter changes are fully realized.

	INFORMATION
	<p>Torch angle in spray mode is markedly different from short arc mode. 90 degree torch angle in reference to the work piece bore axis is standard for spray mode. In some cases, a slightly upward pointing torch is advisable. Variations in torch lead or lag can also aid in bead profile changes, but starting out at a neutral gun angle is best practice. For shorting mode, gun angles from 45° to 60° are a good starting point.</p>

**SHORTING TRANSFER** Shorting transfer mode causes limitations in runtime due to spatter building up on the nozzle. Modulation of inductance and shielding gases will be necessary to supply the least violent shorting action, though for extended trouble free welding, spray transfer is recommended.

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## Repositioning at End of Stroke


When the stepping assembly has come to the end of travel in the Aux Slide Guide Rod, the Radial Rod mount / Junction Box can easily be moved axially on the line bar for continued welding.

To reposition Radial Rod mount;

1. Retrieve the Allen Key for the 90116 Locking Collar hardware. Verify that Locking Collar is tightly attached to the Line Bar underneath the Radial Rod Mount.
2. Retrieve Allen Key for the Radial Rod mount to Line bar coupling screws, and loosen the screws that clamp the Radial Rod Mount to Line Bar.
3. Slide Radial Rod Mount / Junction box assembly and all attached parts up the Line Bar the required amount, then lock the Radial Rod mount to Line Bar clamping screws. Immediately move P/N 90116 locking collar up to the base of the Radial Rod mount as a safety.
4. Extend torch to starting point at end of weld, and resume welding

## Limit Switch System, Aux Step Mechanism

It is important to prevent collision of the step mechanism into any parts of the BW5000 by verifying stroke clearance after initial setup is complete.

	<b>CAUTION</b>
	Severe damage to the Aux Step mechanism and rack on Aux slide Guide Rod will result if the feed mechanism is stopped by any mechanical means other than the limit system.

## Burnback

Burnback is set from the factory to manage most welding applications. However, when operating in Spray mode, it may be necessary to lower or eliminate Burnback. This value is easily changed while NOT welding with a simple Keystroke combination.

To change Burnback, set the Step Dial to any setting from 0 to 10, which corresponds from 0 to 500 milliseconds of burnback time.

HOLD FUNCTION and PURGE simultaneously, then press ARC INTERRUPT to store the STEP dial setting as a time value.

The control comes set at 2.7 on the dial, which corresponds to approximately 130mS Burnback time.

## Optional Equipment – Description and Use

### Conical Welding Capability

Part Number A-2020 Conical Bore Attachment is built to overlay conical surfaces.

The stroke of the Conical Bore Attachment is 10 inches (254 mm), and it connects to the Radial Rod by means of the Radial Rod Extender Stud. The travel arm swivels through 180 degrees of arc, allowing buildup on cones, conical seats, bores and faces.

In practice the operator installs the Conical Bore Attachment, and sets the angle of the travel slide to match the angle of the conical seat. The Torch and Torch adjuster are installed perpendicular to the seat surface, and welding generally progresses from inside out. Step type feed is still utilized, and is adjusted for proper overlap as in normal BoreWelding.

### Small Bore Torch

The Small Bore Torch (A-2053) is a steel bodied torch that is intended for use on Bores under 24 inches in diameter. It differs from the standard A2009 Bore torch due to its curved conduit inlet, and shortened diffuser base, allowing easier reach into small bores. While the Small Bore Torch can be used in any application, it has a lower current carrying capability, and reduced heat sink mass. This torch may be advantageous for certain outside diameter buildups as well as small bore applications..

### Line Bars

The BW5000 can be fitted with different length line bars, 12", 36", 72" and 96". (304.8, 762, 1828.8 and 2438.4 mm)

### Various Configurations

The BW5000 can be arranged to weld faces, bores and outside diameters with simple changes to the configuration of the Radial Rods and Aux slide guide rods. The Radial rods and Aux slide guides are tapped to accept P/N 20077

**FACE WELDING:** This configuration welds a concentric circle pattern on the face of a part. The weld can progress from the outside in or inside out, stepping to the next bead location once per revolution.

Before configuring the BW5000 to weld faces, the operator should insure that there is adequate clearance in the support frame for rotation of the Aux Slide Guide Rod and Radial Rod.

To set up for Face welding, insert the Radial Rod extender Stud in to the tapped end of the Radial Rod suitable for the application at hand. When deciding which Radial Rod to use, choose a Radial Rod that is long enough to support the Aux Slide Guide Rod in position over the face to be welded, but also extend out on the opposite side of the radial Rod Mount/Junction Box to allow placement of Wire Reel or Wire Feeder on Radial Rod.

After installing P/N 20077 Radial Rod Extender into the Radial Rod, screw this assembly into the Aux slide guide Rod, and tighten the two rods together firmly.

Slide this group of parts, radial rod first, into the Radial Rod Mount /Junction Box, then rotate the assembly until the rack of the Aux Slide Guide rod faces away from the face to be welded. This helps to prevent spatter and oxides from fouling the step mechanism. Tighten the Radial Rod

mount Clamp, and proceed to assemble the torch support rods and adjuster as explained previously in this manual.

When installing the torch, set at 45 degrees in relation to the work piece face, with a slight lead in the direction of travel.

Verify step direction by FUNCTION ROT INIT Keystroke, and if the step direction is the wrong, toggle the step direction with FUNCTION EXTEND keystroke.

## Horizontal Axis Mounting Assembly

This assembly supports the BW5000 when welding in the Horizontal Axis.

When using this option, the Horizontal Mounting Assembly Plates are first set up and aligned to the bore using a dummy line bar. After this is complete, AutoBoreWelder line bar is placed in the Horizontal Mounting assembly, the weld head installed, and provisions made for supporting the head and keeping it from rotating counter to the turning forces exerted on the Line Bar.

Welding in the horizontal axis limits the maximum current that can be run with the BW5000, as the vertical up weld bead is limited to approximately 180 amperes maximum current. Travel speeds must be at or near 22 IPM and the voltage a shorting transfer.

The welding wire must be a wire suitable for all position welding, vertical up and down.

For more information regarding horizontal axis welding with the BW5000, consult the Climax Technical Department.

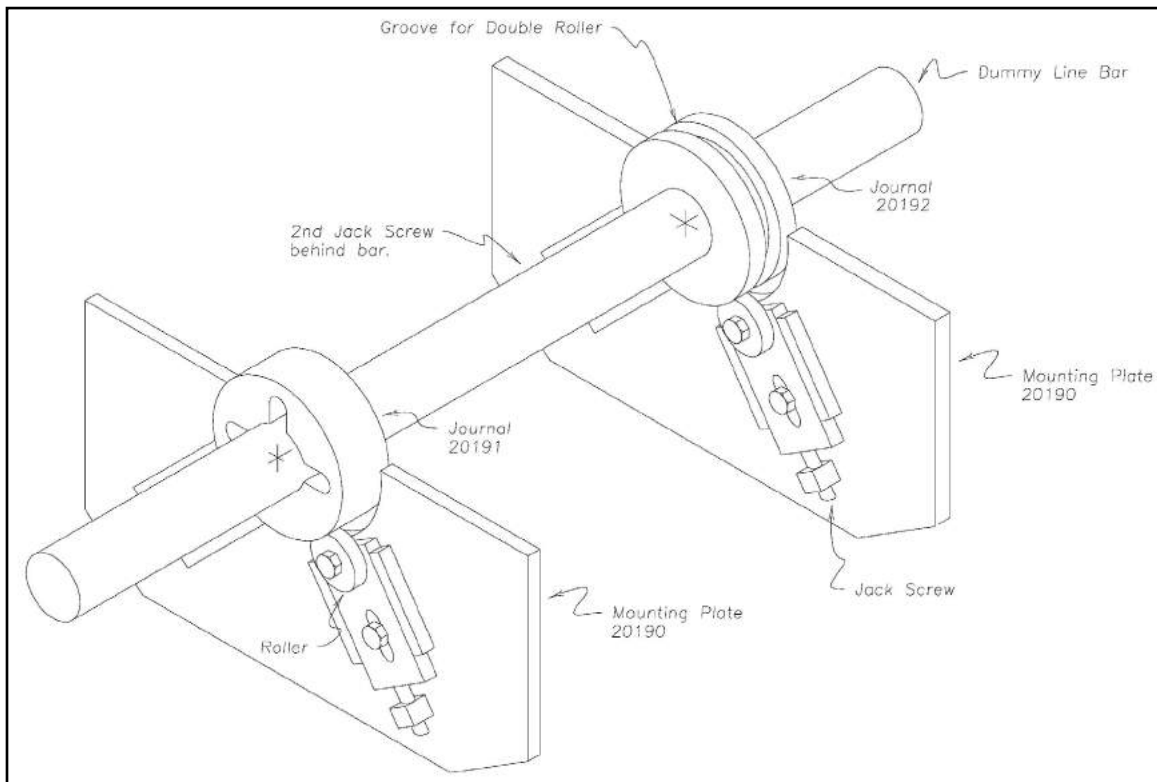


Figure 16 Horizontal Mounting Assembly

## Maintenance and Adjustments

### Daily Maintenance

The BW5000 daily maintenance consists of keeping the AutoBoreWelder clean and protected. The AutoBoreWelder has been designed to survive in industrial environments, which are usually dusty and gritty, but the AutoBoreWelder is a machine tool with close fitting parts, and like most machine tools, will last longer if taken care of.

The AutoBoreWelder should be wiped down after each use, particularly sliding parts such as the Auxiliary Slide Guide Rod and Radial Rods. Lightly coat and wipe clean these parts with a light oil, WD-40 or equivalent. This will keep them sliding freely and protected, and will greatly prolong the life of moving parts.

The Control cables should be wiped down and inspected regularly to prevent downtime or damage.

If the conduit becomes difficult to insert into the Wire feeder or Torch, it may be necessary to lubricate or replace the "O" rings present on each end of the conduit. Use Parker™ "O" lube or equivalent to lubricate "O" rings.


### Long Term Maintenance

Every 15 hours of service, blow out the conduit liner with a shot of compressed air to maintain a clean liner. Replace Liner when necessary.

Every 200 hours, Inspect feed rolls and pressure rolls for wear. If feed rolls need to be changed, it is important not to over torque the screw that secures the feed roll and geared adapter to the axle

Every 500 hours, the Rotating Power Coupling underneath the Base plate of the BW5000 should be lubricated.

The grease cup located on the Brass power coupling is delivered from the factory fully charged, (mostly unscrewed). The greasing procedure for the power coupling is simply to turn the grease cup in 1 turn per 500 hours. If the grease cup bottoms out, then the grease cup must be refilled with special conductive coupling grease, Climax P/N 20182.

	<b>CAUTION</b>
	Under no circumstances should this grease be substituted with any other type of grease or severe damage may result. DO NOT over-grease the power coupling.

After the cup is filled, the operator need only to turn the cup on 1 complete turn, fulfilling the 500 hour requirement.

### Adjustments

#### Wire Feeder

The pressure on the feed rolls is delivered preset to about 3 (three) on the pressure arms.

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Feed roll pressure should be set at a level which allows the feed rolls to slide on the wire if the wire is stopped at the contact tip.

Typical setting of the pressure roll barrel "3".

### Rotation Drive Chain

The rotation drive chain operates in the horizontal plane. Therefore, it is very important that the drive chain have minimal operating slack.

If the chain is loose, it is possible that the chain will climb off the sprocket, causing damage to the motor or other components.


If there is any backlash noted in the drive system of the BW5000, the chain must be tightened.

To tighten drive chain, remove the red shroud from the head of the BW5000.

Loosen bolts holding the rotation motor, and lever Rotation motor to tension the chain.



Figure 17 Drive Chain Adjustment

	<b>IMPORTANT</b>
	<p>The rotation motor sprocket must be level with and in the same plane as the driven spindle sprocket. A 6 inch machinist scale is helpful in verifying this accurately. Tighten the inner Rotation motor hold down bolt lightly first, then checking the height and alignment with the scale, make the final adjustments, and re-torque rotation motor hold down screws.</p>

### Removal of Aux Step Mechanism from Aux Slide Guide Rod

The Aux Step mechanism can be removed easily from the Aux Slide guide Rod, if the proper procedure is followed. (See Figure 18)

Incorrect procedure to remove the Aux Step mechanism will result in severe damage to the Aux Slide Guide Rack, Aux Step Motor Pinion, and Aux Step Motor gear train.

#### To remove the Aux Step Mechanism:

1. Electrically disconnect the Aux Step Mechanism from the BW5000.
2. Remove the Shroud from the step drive motor. (Bubble #1 Fig 18)



3. Undo the motor lead connections in the space revealed when the Motor shroud is removed
4. Remove the two Allen Head cap screws which fasten the steel plate the main block. (Bubble #2 Fig 18) Do not remove the steel plate from the step motor.
5. Slide the step motor off of the main block.( P/N 20202)
6. Remove the main block from the Aux Slide Guide Rod

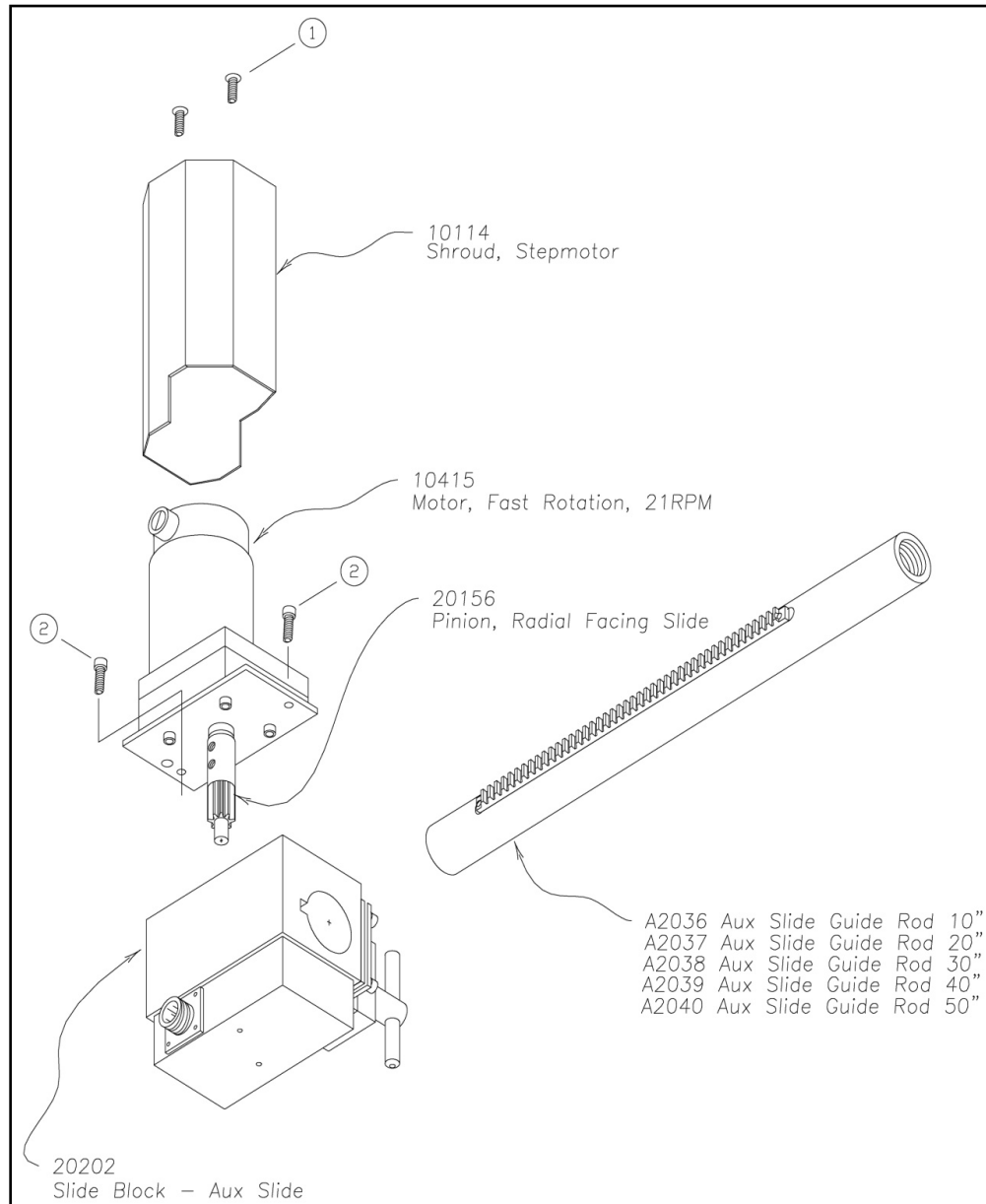


Figure 18 Removal of Step Assembly

Perform intended maintenance, and clean the main block slide bore.

Before reassembling, it is important to grease the end of the pinion sparingly.

Do not grease the actual pinion teeth, as grease on the pinion teeth will transfer to the rack, causing dirt and grit to collect.

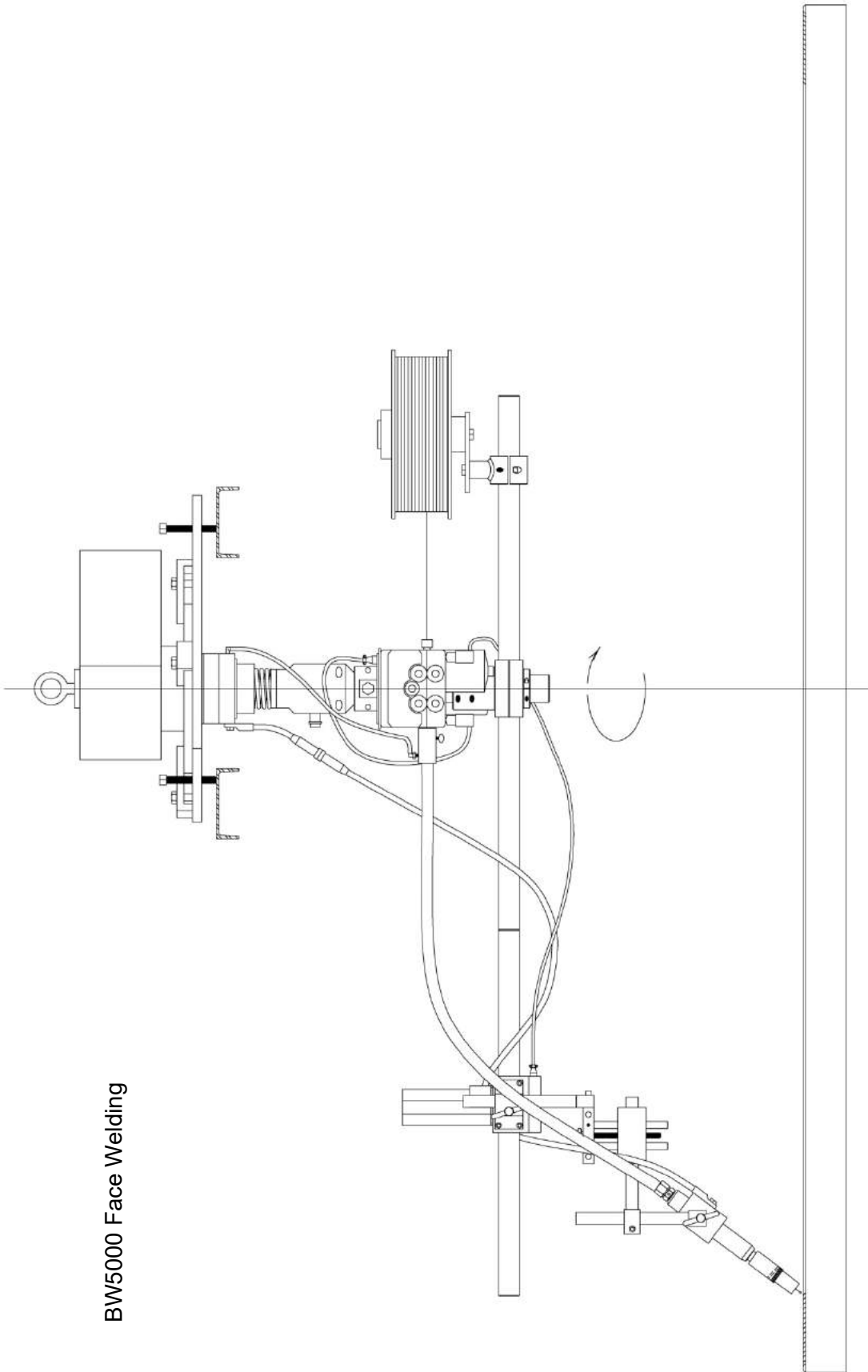
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## Configuration Line Drawings

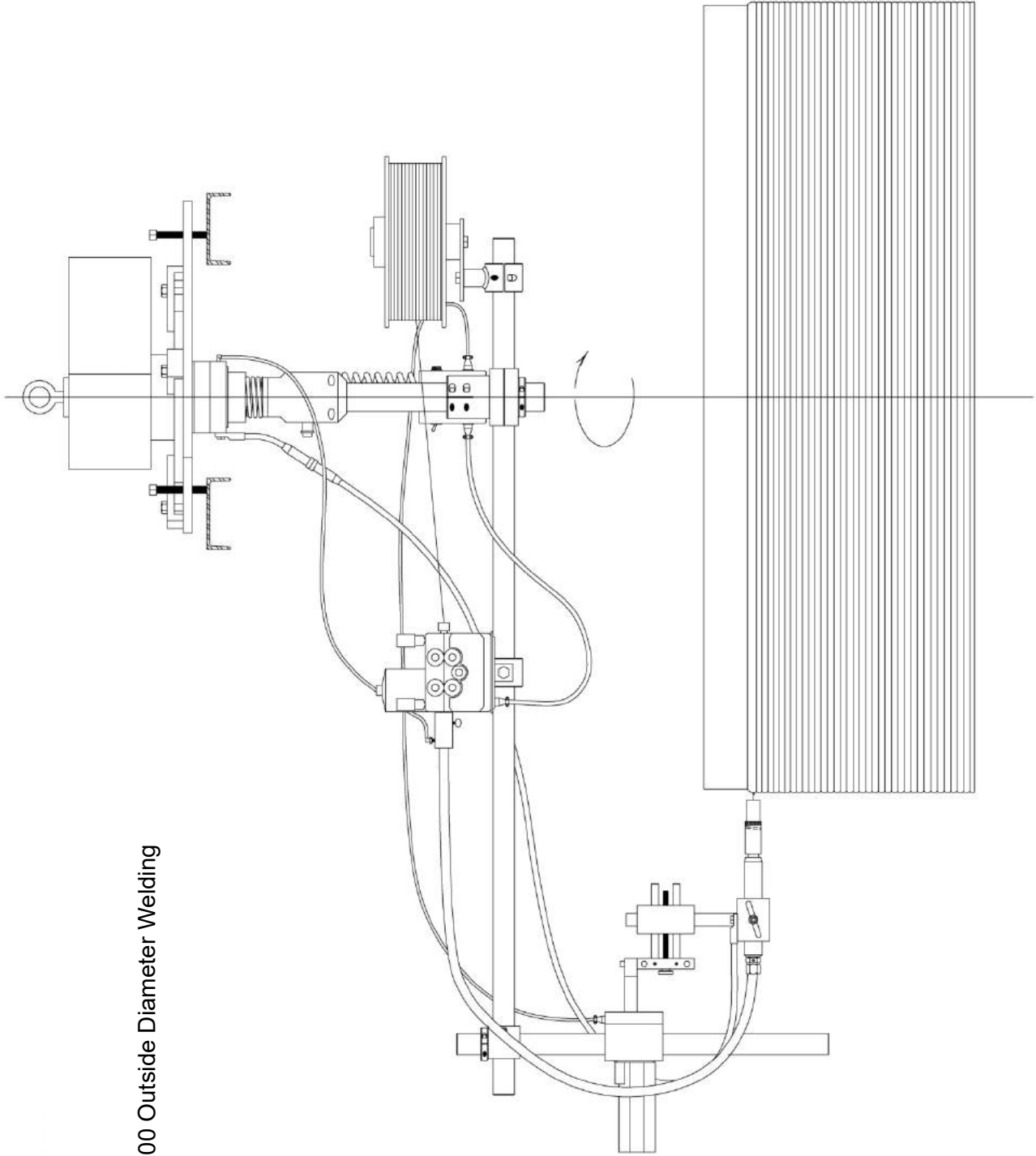
The following pages detail the different basic configurations of the BW5000.

The drawings are suggestions, and it should be kept in mind that the BW5000 can be assembled in different ways to complete an application.

If the application drawings do not cover your specific application, contact Climax Technical Support.

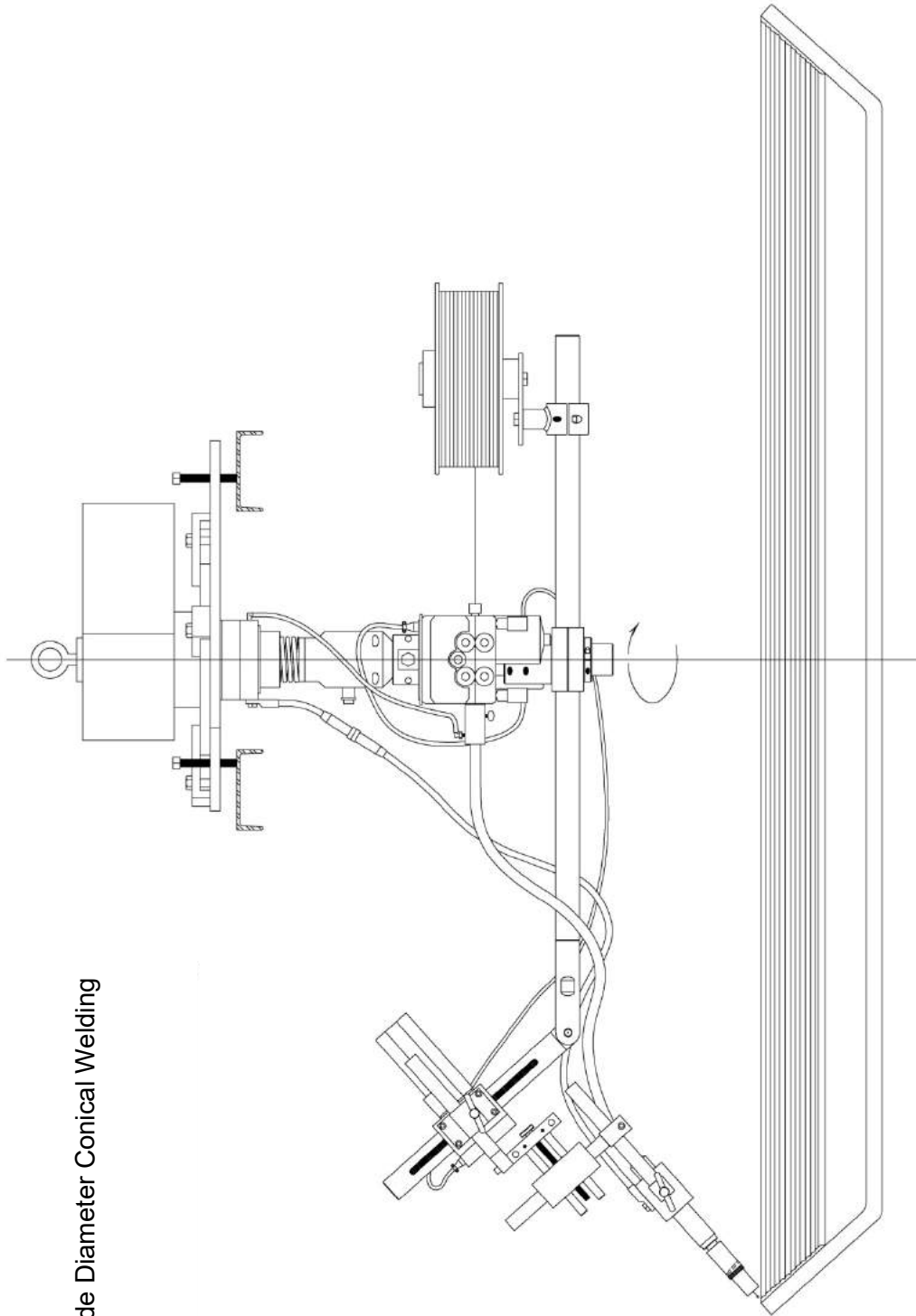


BW5000 Face Welding

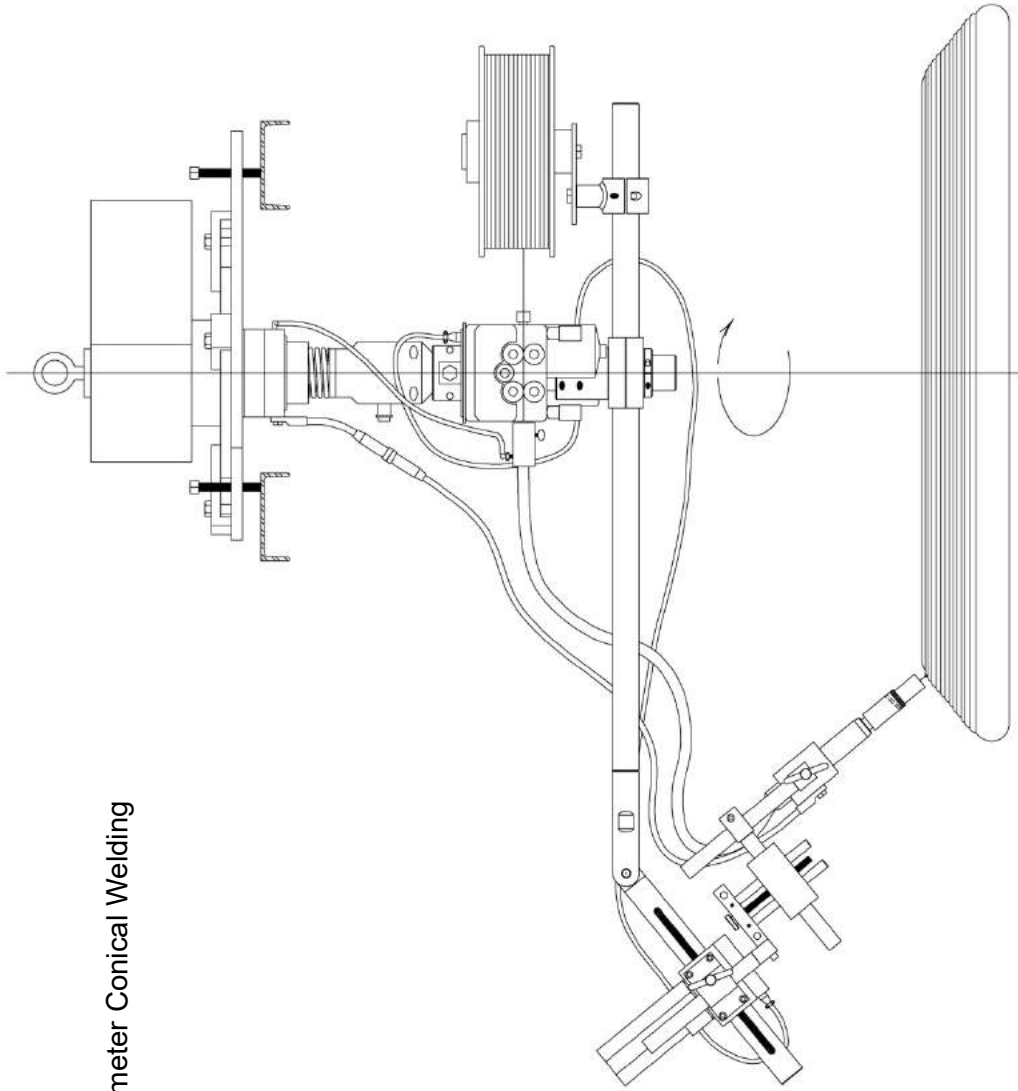


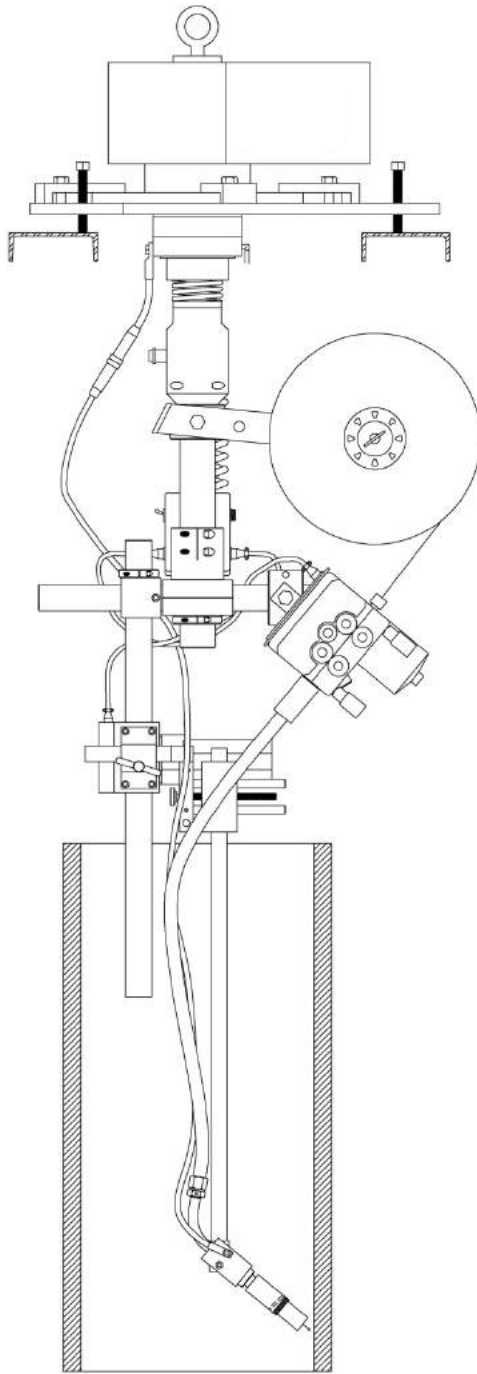
BW5000 Outside Diameter Welding

BW5000 Inside Diameter Conical Welding

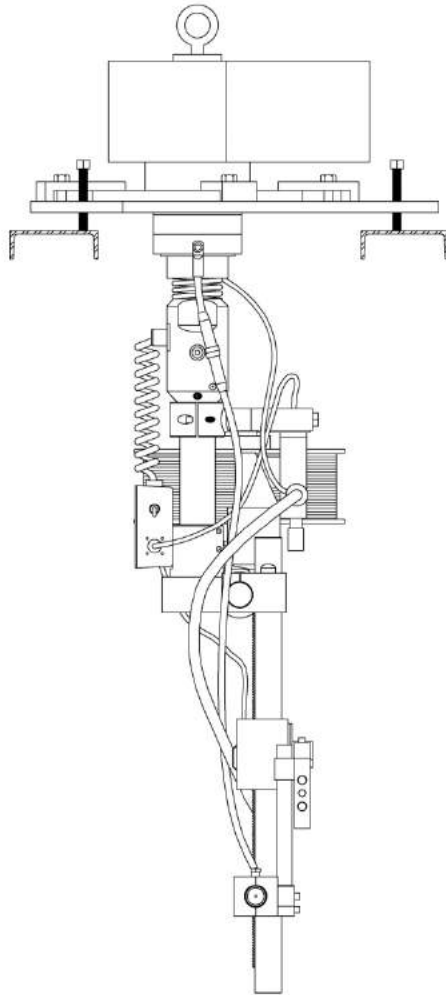


BW5000 Outside Diameter Conical Welding





BW5000 Small Bore Torch Welding



BW5000 Torch Offset / Centerline



## Shipping and Storage

### Shipping

The crate the machine arrived in is designed for safe shipment of the machine. Use the crate and packing components that the machine arrived in for repackaging the machine.

### Storage

This equipment is intended to be stored indoors in a temperature and humidity controlled environment.

#### Preparing the Machine for Storage

- Ensure the machine is free from dirt, grease, chips and other debris before storage.
- Apply a moisture preventative material to unpainted surfaces (WD-40 for short-term storage, LPS-3 for long-term storage) to prevent corrosion.
- Store the machine in the crates provided.
- Place desiccant bags or vapor wrap around the machine to absorb moisture.

Climax advises changing the desiccant bags in the storage crate every 18 months.

#### Ideal Long-Term Storage Conditions

Ideal long-term storage conditions are cool and dry indoors (50°F and 20% relative humidity). While such conditions may not be realistic for your setting, do not let temperatures exceed 70°F, and if possible, keep the relative humidity below 40%. Make every effort to keep temperature and relative humidity levels constant.

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## Recommended Spare Parts

### Tool Kit 71986

PART	DESCRIPTION	QTY
10199	WRENCH HEX 1/4 SHORT ARM	1
11080	WASHER 3/8 FLTW SAE	4
12217	SCREW 3/8-16 X 2-1/2 SHCS	1
13987	NUT 3/8-16 STDN ZINC PLATED	1
29383	WRENCH HEX 3/8 LONG ARM	1
33999	WRENCH HEX SET .050 - 3/8 BONDHUS BALL END (KB)	1
65895	GREASE CONDUCTIVE ELECTRICAL JOINT 1 OZ	1
67082	GLOVES WELDING CLIMAX BRANDED SIZE LARGE	1
67162	LINER STAINLESS STEEL .065 ID X .188 OD (STOCKED IN INCHES)	240
67337	LUBRICANT 3 OZ WD-40	1
67453	FEED ROLL V-GROOVE .045/.062	2
67461	WRENCH HEX 5/16 LONG ARM	1
68191	MANUAL INSTRUCTION MODEL BW5000 BOREWELDER	1
71994	KIT CONSUMABLES PACKAGE BW5000	1

### Consumables Kit 71994

PART	DESCRIPTION	QTY
67547	DIFFUSER GAS MIG GUN	2
67548	NOZZLE MIG GUN	5
67549	INSULATOR MIG GUN	2
67555	TIP CONTACT .045 MIG GUN	10
67557	TIP CONTACT .062 MIG GUN	10
67594	BOX PLASTIC TRANSLUCENT W/ ADJ COMPARTMENTS 10-7/8 X 6-7/8 X 1-7/8	1

## Exploded Views and Parts Lists

The following diagrams and parts lists are for your reference purposes only. The machine Limited Warranty is void if the machine has been tampered with by anyone who has not been authorized in writing by Climax Portable Machining and Welding Systems, Inc. to perform service on the machine.

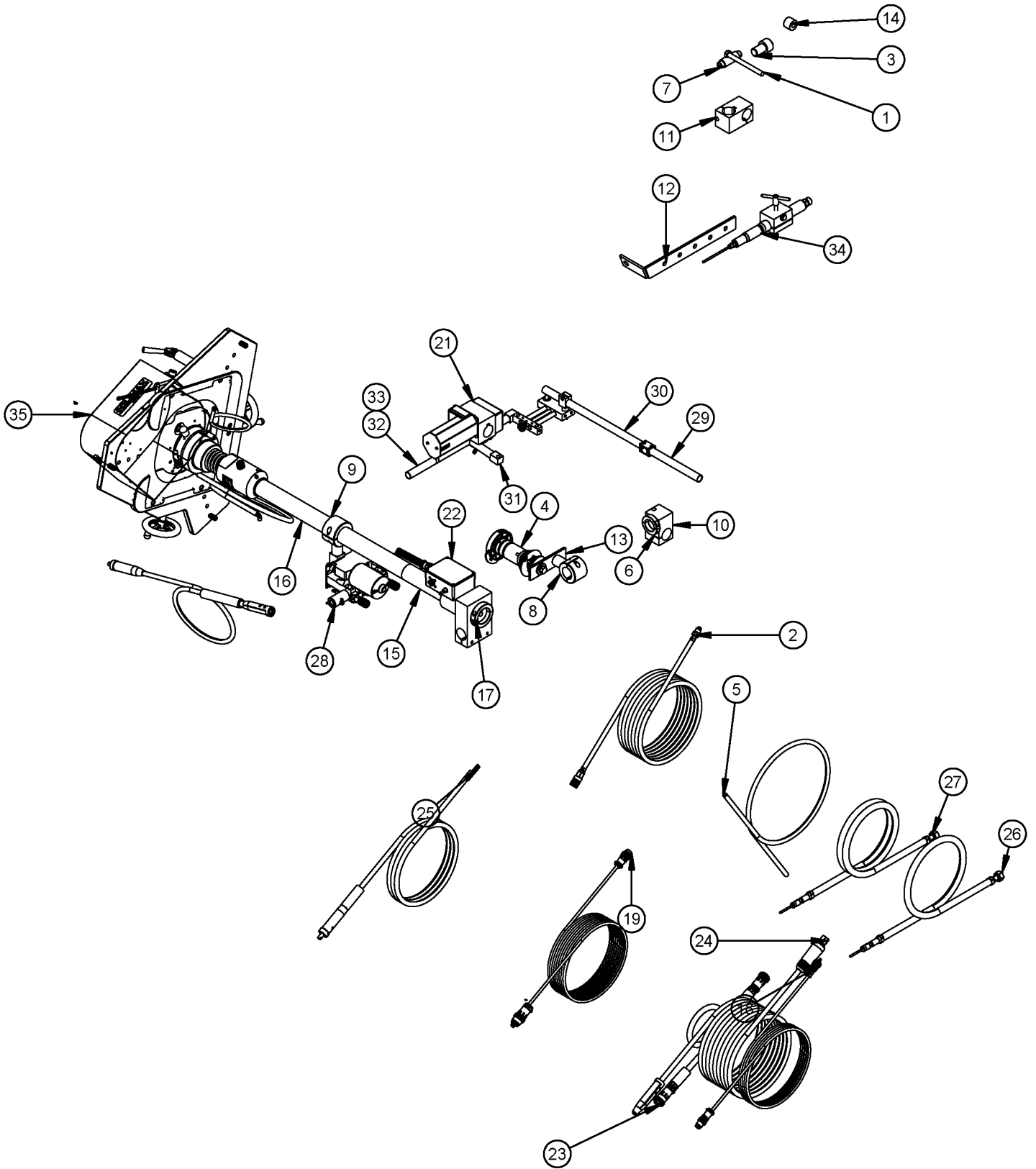
### Drawing List

1. 71991 – BASE UNIT MODEL BW5000 BOREWELDER
2. 30774 – SHIELDING GAS HOSE ASSEMBLY
3. 46555 – SUPPORT WIRE REEL
4. 68994 – CABLE ASSY PULL FEEDER CONTROL PLASTIC CONNECTORS 15 FT
5. 69408 – CABLE WIRE FEED CONTROL 25 FT MICRO 24V
6. 70105 – ADJUSTER AUX TORCH
7. 70106 – STEPPING UNIT AUX W/O AUX SLIDE GUIDE ROD
8. 70107 – BAR HOLDER MOUNT FIXED PLACE
9. 70112 – ASSY COIL CORD
10. 70108 – ASSY CABLE CONTROL 25' 306-P
11. 70109 – CABLE WELD POWER POSITIVE #1/0 SUPPLY
12. 70110 – ASSY CABLE WELD TORCH
13. 70113 – CONDUIT 48" WIRE FEED
14. 70114 – CONDUIT 72" WIRE FEED
15. 70117 – WIREFEEDER PORTABLE W/ .045/.062 ROLLS BW5000
16. 70118 – ROD CLAMPING TORCH SUPPORT 8"
17. 70119 – ROD CLAMPING TORCH SUPPORT 16"
18. 70120 – ROD TORCH SUPPORT 90 DEG BEND
19. 70122 – SUPPORT TORCH 16"/410MM
20. 70123 – SUPPORT TORCH 8"/200MM
21. 70126 – TORCH STD 2ND GEN BW5000
22. 70192 – HEAD COMPLETE BW5000 NON ENCODER AUTO-SKIP X-Y ADJ
23. 70101 – ASSY PLATE MTG WITH X-Y ADJ
24. 70102 – BW5000 AUTO-SKIP
25. 70116 – NON ENCODER 1200 X-Y VERSION
26. 70212 – HEAD BASIC BW5000

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## Optional Parts Drawings

1. 29824 – CABLE ASSY POWER SUPPLY MILLER 14 PIN W/ 100V PIGTAIL PLASTIC CONNECTORS 25 FT
2. 72101 – CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 25 FT
3. 34217 – CABLE ASSY POWER SUPPLY MILLER XMT 14 PIN PLASTIC CONNECTORS 25 FT
4. 36874 – CABLE ASSY POWER SUPPLY BLANK ONE END PLASTIC CONNECTORS 25FT
5. 45490 – CABLE ASSY POWER SUPPLY PLASTIC CONNECTORS 25 FT EUTECTIC PULSARC 6000 OR ESAB LAI 550P
6. 46670 – CABLE ASSY POWER SUPPLY MILLER MILLERMATIC 10 PIN PLASTIC CONNECTORS 25 FT
7. 72138 – CABLE ASSY POWER SUPPLY LINCOLN MULTI WELD 6 PIN PLASTIC CONNECTORS 25 FT
8. 69916 – CABLE ASSY POWER SUPPLY ESAB 350MPI 14 PIN PLASTIC CONNECTORS 25 FT
9. 69918 – CABLE ASSY POWER SUPPLY MILLER DELTAWELD 5 PIN PLASTIC CONNECTORS 25 FT
10. 70103 – ASSY GUIDE AUXILIARY SLIDE 30 IN TRAVEL
11. 70104 – ASSY GUIDE AUXILIARY SLIDE 50 IN TRAVEL
12. 70193 – CONICAL SEAT STEP MECHANISM AUX 10 INCH STROKE
13. 70427 – ASSY GUIDE AUXILIARY SLIDE 10 IN TRAVEL
14. 70428 – ASSY GUIDE AUXILIARY SLIDE 20 IN TRAVEL
15. 70429 – ASSY GUIDE AUXILIARY SLIDE 40 IN TRAVEL
16. 71988 – KIT SMALL BORE TORCH 12 - 24 IN ID BW5000
17. 71989 – KIT RADIAL RODS BW5000 RANGE 24 - 120 ID / 24 - 96 OD
18. 71990 – KIT RADIAL RODS BW5000 RANGE 24 - 144 ID / 24 - 120 OD
19. 72068 – KIT RADIAL RODS BW5000 RANGE 24 - 120 ID / 24 - 96 OD
20. 72071 – BAR LINE 96 INCH KEYLESS W/ CRATE



BASE UNIT MODEL BW5000 BOREWELDER

71991

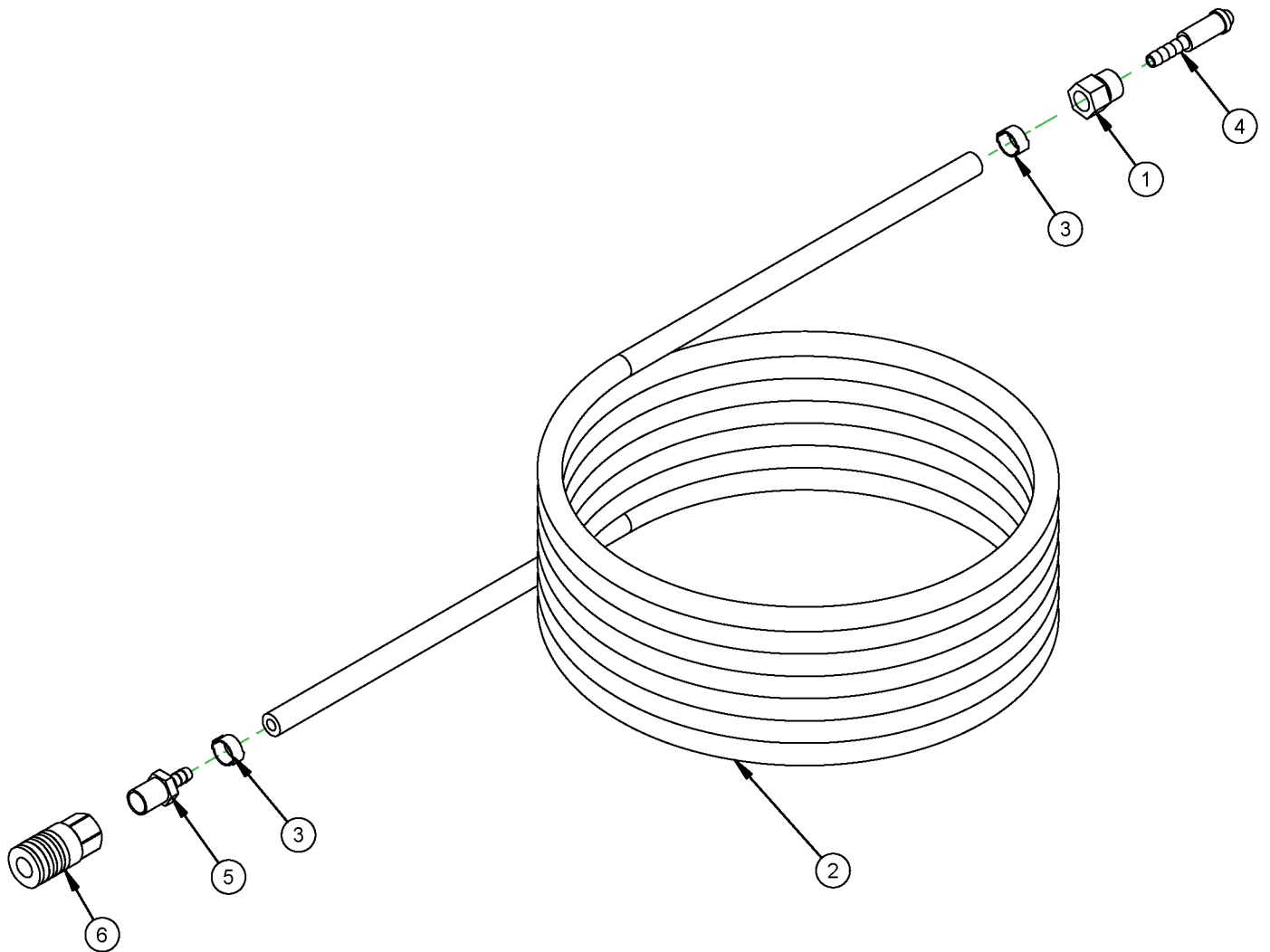
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	17747	SCREW 1/2-13 X 5-1/2 HHCS GR 5 PLN
2	1	30774	SHIELDING GAS HOSE ASSEMBLY
3	1	36236	SCREW 1-8 X 1-1/2 SHCS
4	1	46555	SUPPORT WIRE REEL
5	1	64063	HOSE 1/4 ID X 1/2 OD
6	1	66970	CLAMP COLLAR SPLIT 1-1/2 ID
7	1	67421	CONNECTOR ROD RADIAL
8	1	67483	MOUNT ACCESSORY 1.5 IN
9	1	67485	MOUNT ACCESSORY 2 IN
10	1	67507	COUPLING RODS RADIAL 90 DEG
11	1	67512	COUPLING W/KEY 1.5 RADIAL RODS 90 DEG
12	1	67527	BRACKET WIRE SPOOL PORTABLE
13	1	67529	BRACKET SPOOL PLAIN PORTABLE
14	1	67531	BUSHING FEEDER PORTABLE
15	1	67542	BAR LINE 12 IN KEYLESS
16	1	67543	BAR LINE 36 IN KEYLESS
17	1	67668	CLAMP COLLAR SPLIT 2.0 ID
18	1	68994	CABLE ASSY PULL FEEDER CONTROL PLASTIC CONNECTORS 15 FT
19	1	69408	CABLE WIRE FEED CONTROL 25 FT MICRO 24V
20	1	70105	ADJUSTER AUX TORCH
21	1	70106	STEPPING UNIT AUX W/O AUX SLIDE GUIDE ROD
22	1	70107	BAR HOLDER MOUNT FIXED PLACE
23	1	70108	ASSY CABLE CONTROL 25' 306-P
24	1	70109	CABLE WELD POWER POSITIVE #1/0 SUPPLY
25	1	70110	ASSY CABLE WELD TORCH
26	1	70113	CONDUIT 48" WIRE FEED
27	1	70114	CONDUIT 72" WIRE FEED
28	1	70117	WIREFEEDER PORTABLE W/ .045/.062 ROLLS BW5000
29	1	70118	ROD CLAMPING TORCH SUPPORT 8"
30	1	70119	ROD CLAMPING TORCH SUPPORT 16"
31	1	70120	ROD TORCH SUPPORT 90 DEG BEND
32	1	70122	SUPPORT TORCH 16"/410MM
33	1	70123	SUPPORT TORCH 8"/200MM
34	1	70126	TORCH STD 2ND GEN BW5000
35	1	70192	HEAD COMPLETE BW5000 NON ENCODER AUTO-SKIP X-Y ADJ
N/S	1	70191	CONTAINER SHIPPING BW5000
N/S	1	71470	CRATE 75-1/2 X 20-1/2 X 7-1/2 BW5000 BARS
N/S	1	71986	KIT TOOL MODEL BW5000

BASE UNIT MODEL BW5000 BOREWELDER

71991



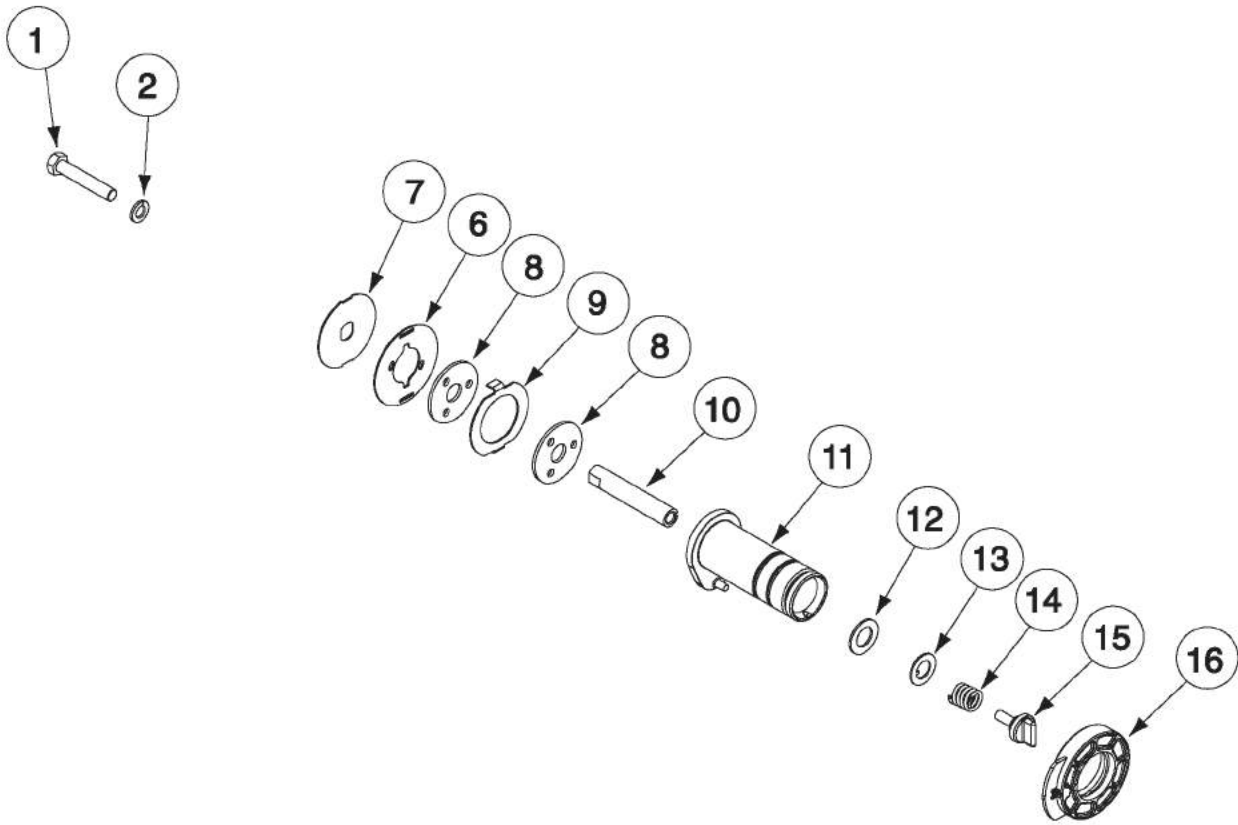
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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	48939	NUT SIZE B INERT GAS
2	240 in	64063	HOSE 1/4 ID X 1/2 OD
3	2	67007	CLAMP HOSE 1/2 DIA DBL PINCH STEEL
4	1	67033	FTG NIPPLE INERT GAS B SIZE 1/4 HOSE
5	1	67065	FTG HOSE END 1/4 HOSE TO 1/4 NPTF
6	1	72570	FTG QUICK COUPLER 1/4B 1/4 NPTF FEMALE AIR ARO STYLE

## SHIELDING GAS HOSE ASSEMBLY

30774



NOTE: SUPPLIED BY LINCOLN ELECTRIC AS PART K162-1

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	T8833-48	1/2-13 x 2.75 HHCS
2	1	E106A-15	LOCK WASHER
3	1		
4	1		
5	1		
6	1	S24622	ADAPTER PLATE
7	1	S23972	BRAKE PLATE
8	2	S17435-4	FRICTION WASHER
9	1	S23968	BRAKE PLATE LOCK
10	1	S22975	SPINDLE SHAFT
11	1	L10560	SPINDLE
12	1	S17435-3	FRICTION WASHER
13	1	T12965-2	KEYED WASHER
14	1	T11862-14	COMPRESSION SPRING
15	1	T14813-B	THUMB SCREW
16	1	S23811	RETAINING COLLAR ASSEMBLY

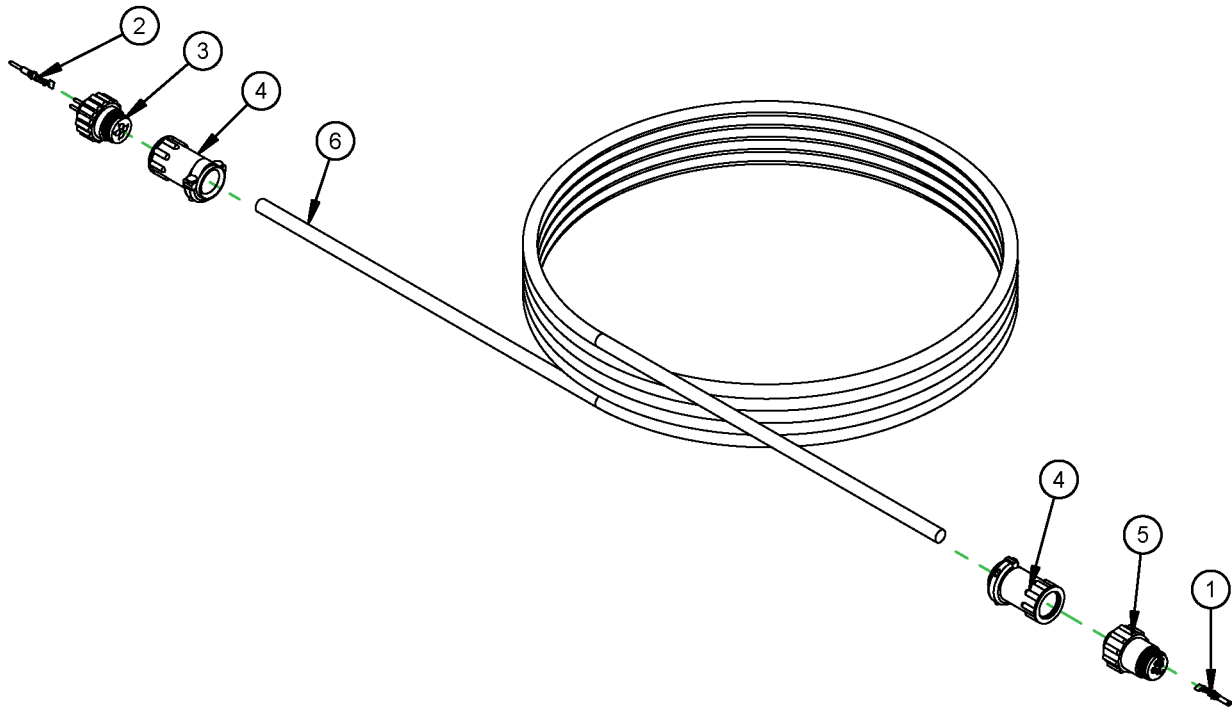
SUPPORT WIRE REEL

46555

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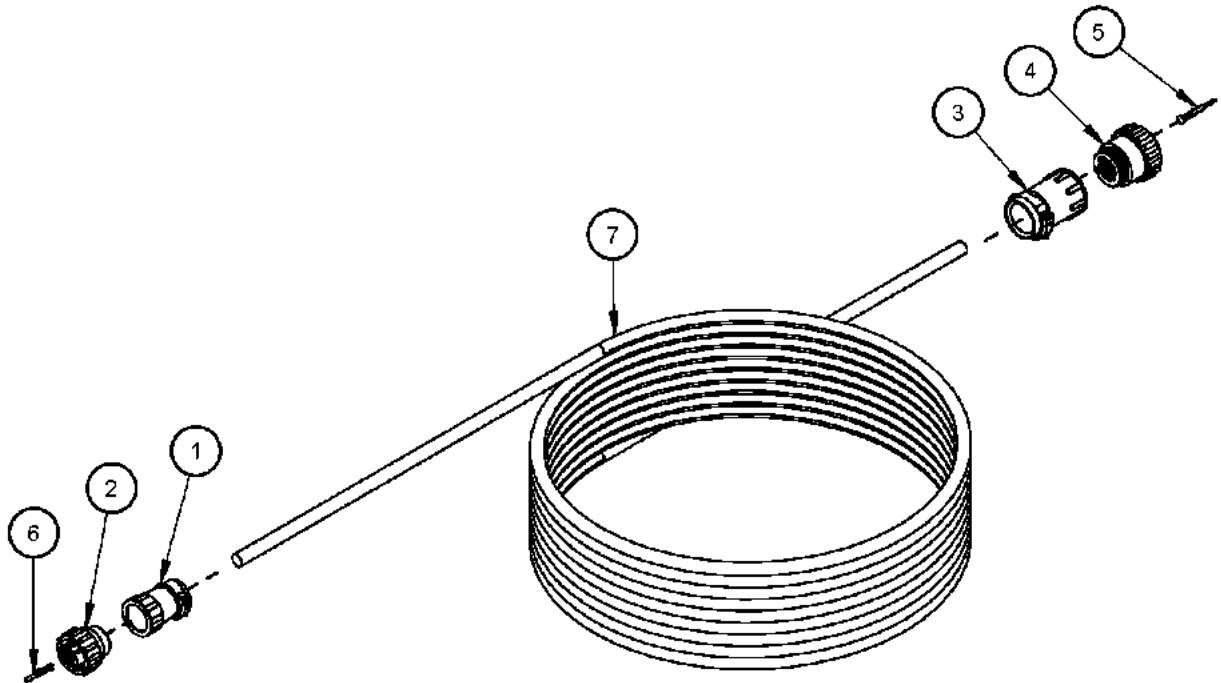




PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	47011	CONTACT SOCKET AWG 24 TO 20
2	4	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
3	1	67057	CONNECTOR PLUG 11-4 METAL SHELL
4	2	67060	CABLE CLAMP LARGE SIZE 11
5	1	67160	CONNECTOR PLUG 4 PIN REVERSE MALE/FEMALE SIZE 11
6	180in	67297	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD

**CABLE ASSY PULL FEEDER CONTROL PLASTIC  
CONNECTORS 15 FT**

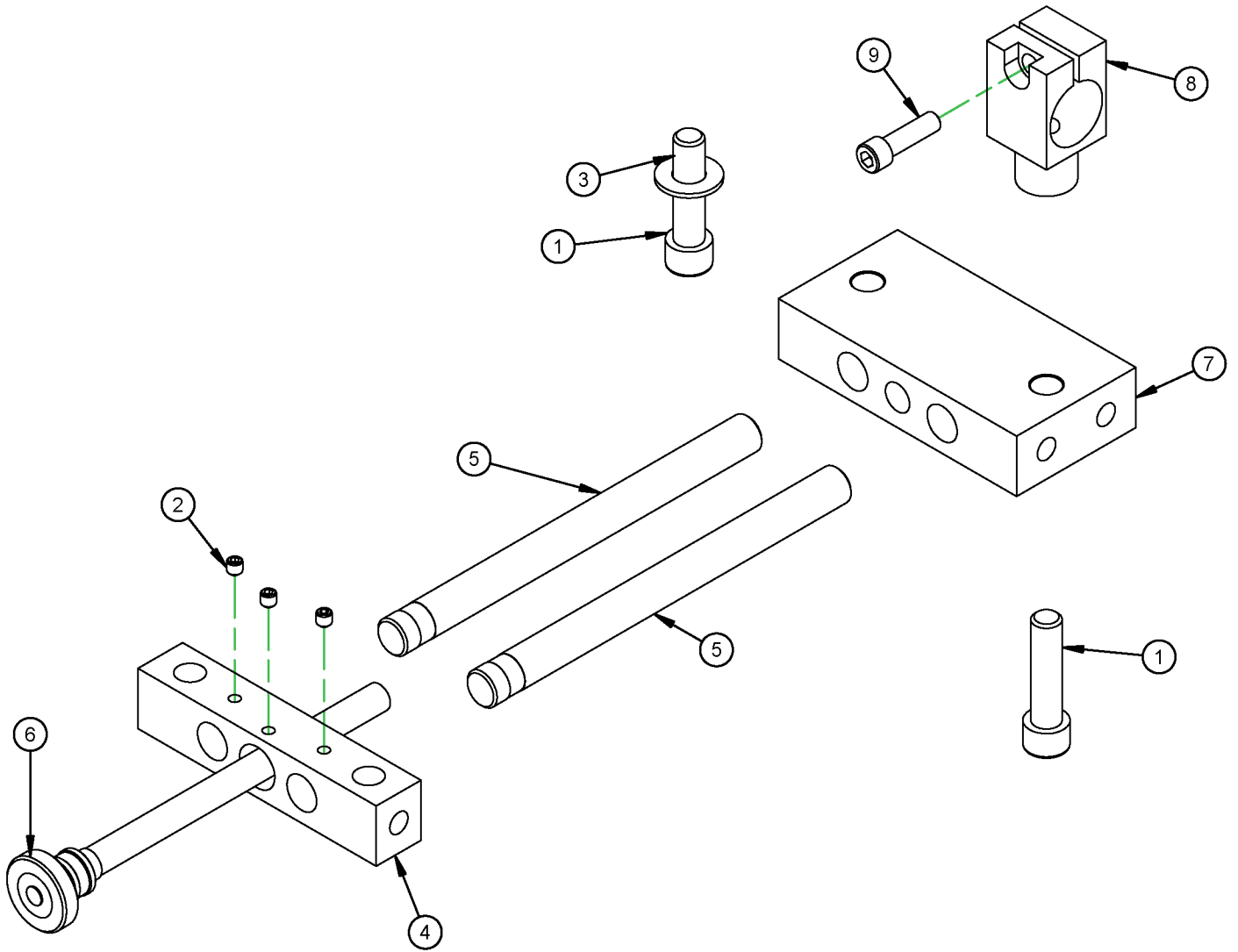
68994



PARTS LIST

ITEM	QTY	P/N:	DESCRIPTION
1	1	15295	CLAMP CABLE STANDARD SIZE 13
2	1	17912	PLUG 9 FEMALE CONTACTS SIZE 13
3	1	47012	CLAMP CABLE SIZE 17 PLASTIC
4	1	58576	CONNECTOR PLUG 17-14 PLASTIC
5	7	67155	TERMINAL PIN 18-16 AWG
6	5	67482	CONTACT SOCKET AWG 18-16 CRIMP
7	300in	83988	CORD TYPE SOOW 18 AWG 5 COND 600V .325 OD UNSHIELDED GRAY JACKET

**69408 - CABLE WIRE FEED CONTROL 25 FT MICRO 24V - REV B**  
 FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10474	SCREW 3/8-16 X 1-1/2 SHCS
2	3	11050	SCREW 10-32 X 3/16 SSSCP
3	1	11080	WASHER 3/8 FLTW SAE
4	1	67492	BLOCK MAIN AUX SLIDE
5	2	67493	RAIL AUX SLIDE
6	1	67501	SCREW ADJUST AUX SLIDE
7	1	67491	SLIDE BLOCK AUX SLIDE
8	1	67506	CLAMP TORCH TRAMMEL BW5000
9	1	17131	SCREW 1/4-20 X 7/8 SHCS

ADJUSTER AUX TORCH

70105

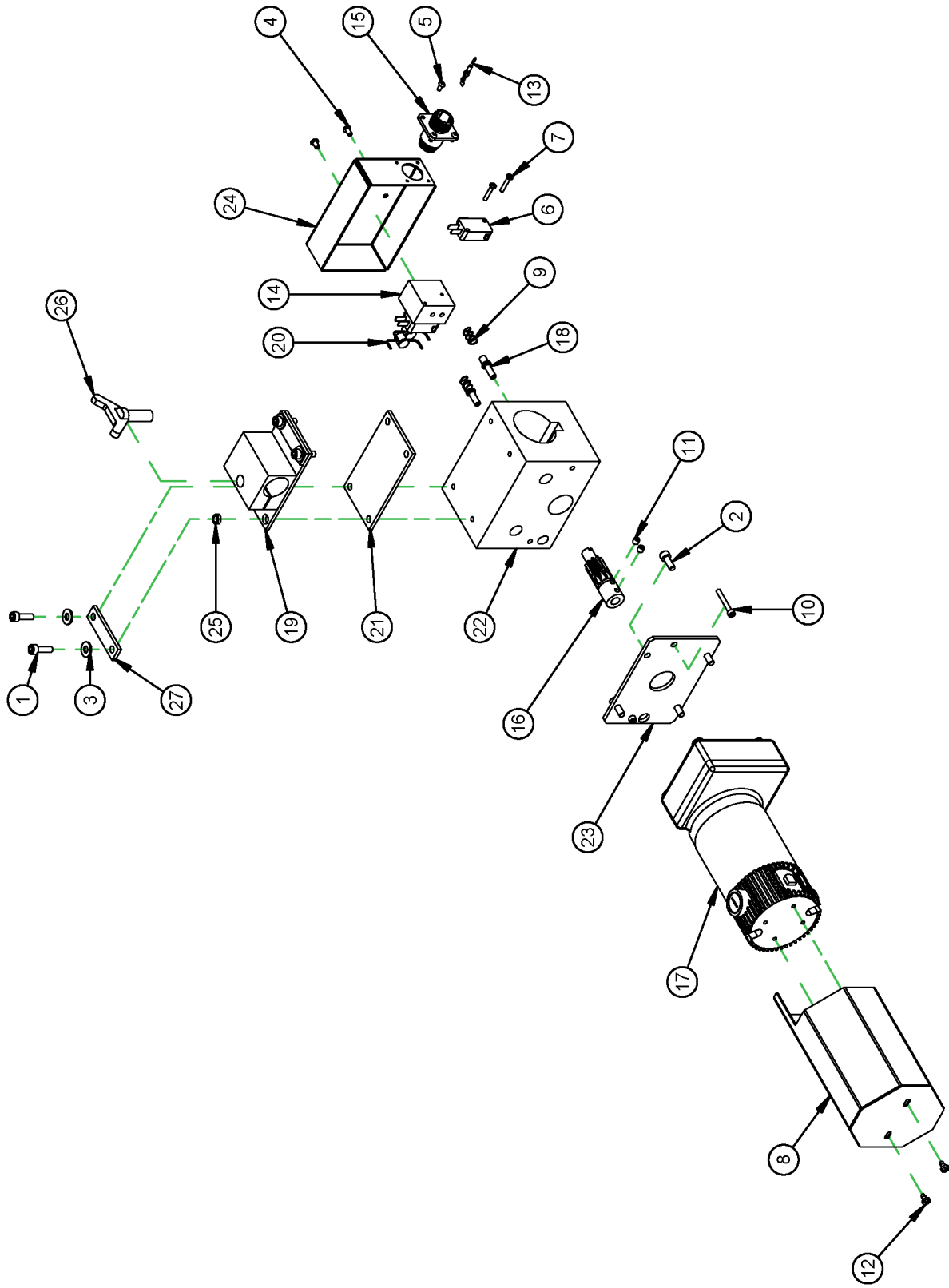


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STEPPING UNIT AUX W/O AUX SLIDE GUIDE ROD

70106

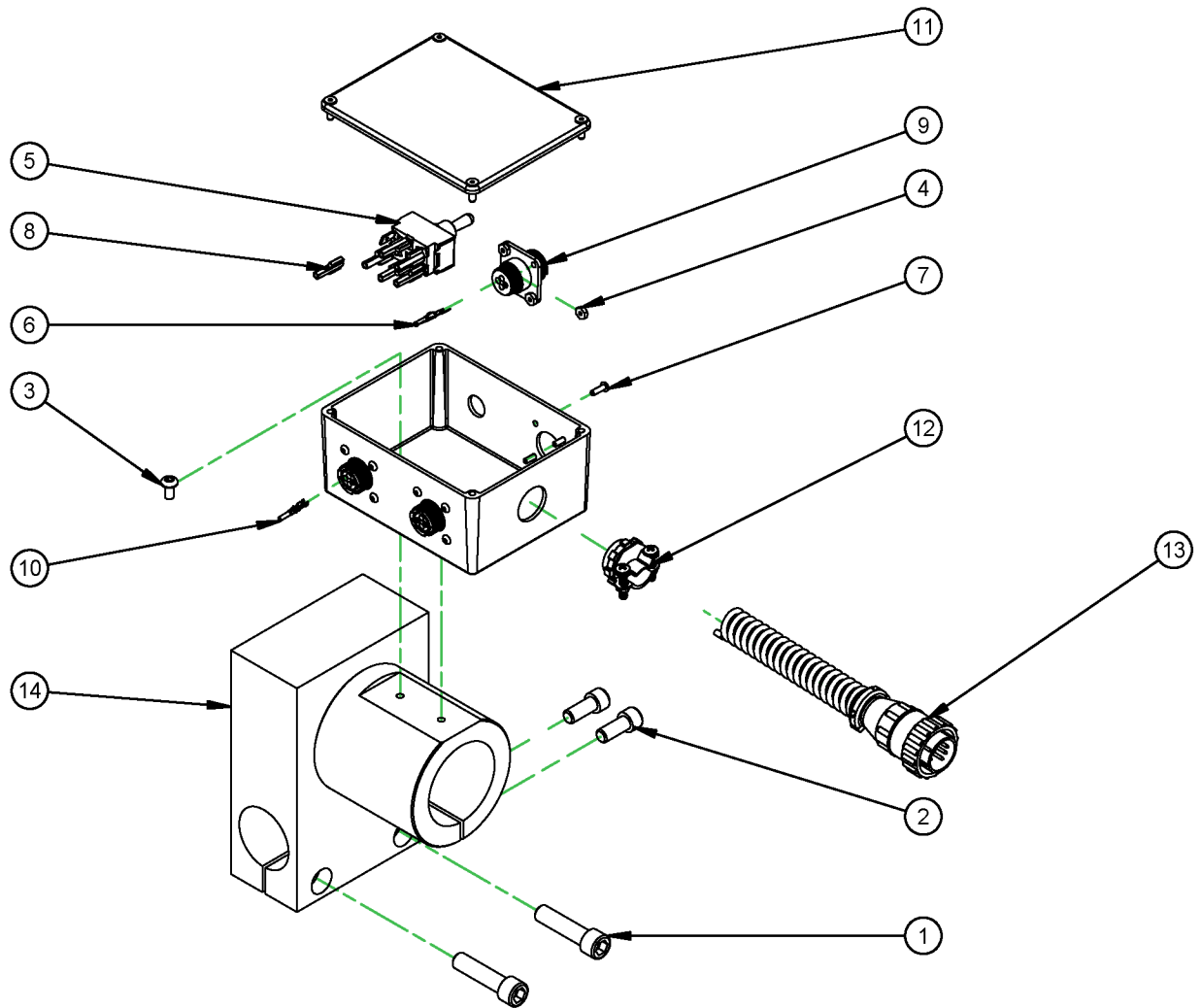
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10157	SCREW 10-32 X 5/8 SHCS
2	6	10877	SCREW 10-32 X .5 SHCS
3	4	11315	WASHER #10 FLTW
4	2	12599	SCREW 6-32 X 1/4 BHSCS
5	4	37397	SCREW 4-40 X 1/4 BHSCS
6	2	37408	SWITCH LIMIT QUILL
7	4	40559	SCREW 4-40 X 5/8 SPHMS
8	1	40565	SHROUD MOTOR ROTATION
9	2	40583	SPRING COMP .30 OD X .022 WIRE X .625 LONG
10	2	40585	SCREW 6 - 32 X 1 SHCS
11	2	44800	SCREW 10-32 X 3/8 SSSFP
12	2	48582	SCREW 6-32 X 1/4 PPHSTS SELF TAPPING BLACK OXIDE
13	2	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
14	1	66977	BLOCK MTG TRAVEL LIMIT
15	1	67063	CONNECTOR PLUG 11-4 PLASTIC
N/S	12in	67123	WIRE 20 AWG RED CU STRAND TYPE MTW
N/S	12in	67124	WIRE 20 AWG ORANGE CU STRAND TYPE MTW
N/S	12in	67125	WIRE 20 AWG YELLOW CU STRAND TYPE MTW
N/S	12in	67134	WIRE 20 AWG BLACK CU STRAND TYPE MTW
16	1	67157	PINION RADIAL FACING SLIDE
17	1	67190	GEARMOTOR PAINTED BW3000 90 VDC 11 RPM TENV
18	2	67343	FEELER RACK LIMIT
19	1	67419	SUPPORT LG TORCH ROD BLOCK
20	2	67451	DIODE 200V 6A
21	1	67463	INSULATOR TORCH BLOCK
22	1	67470	SLIDE FACING RADIAL
23	1	67472	SLIDE MOTOR PLATE RADIAL
24	1	67473	COVER RADIAL FACING SLIDE
25	4	67584	BUSHING INSULATOR
26	1	67678	SCREW 3/8-16 X 1 WING THUMB
27	2	68188	STRIP ISOLATION

STEPPING UNIT AUX W/O AUX SLIDE GUIDE ROD

70106



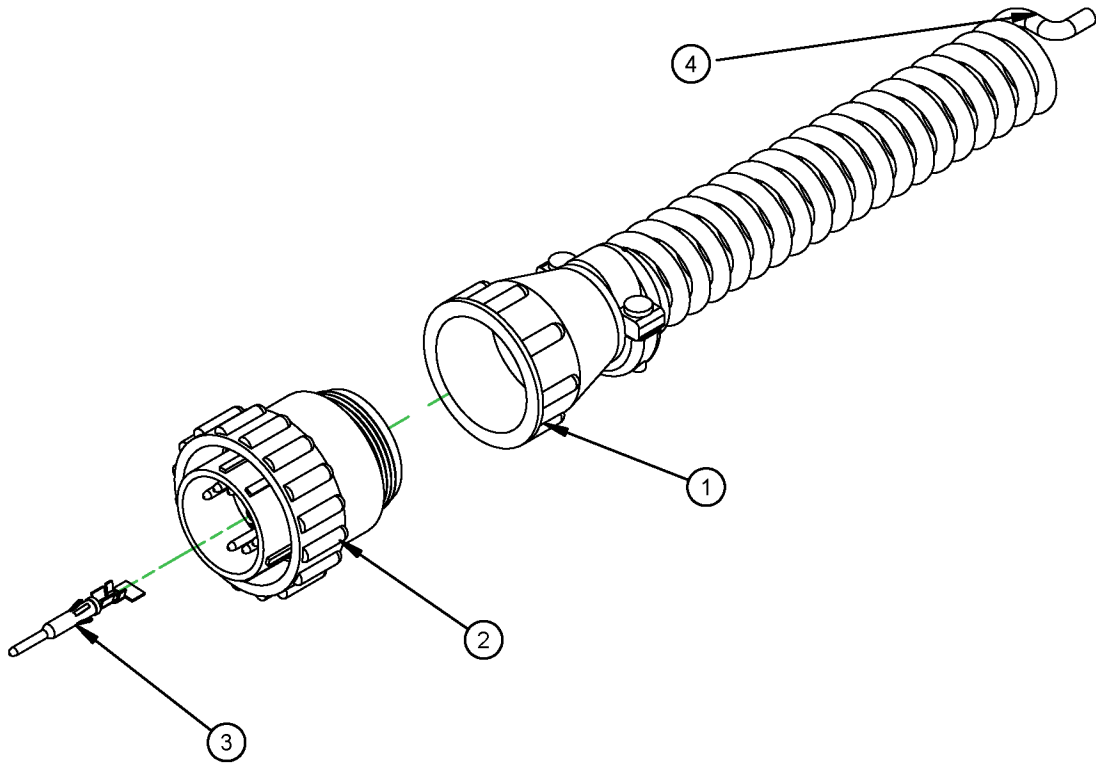
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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10474	SCREW 3/8-16 X 1-1/2 SHCS
2	2	10657	SHCS 5/16-18 X 3/4
3	2	11678	SCREW 10-32 X 3/8 BHSCS
4	12	12442	NUT 4-40 STDN ZINC PLATED
5	1	40520	SWITCH SPDP 15/32" HOLE DIA
6	2	47011	CONTACT SOCKET AWG 24 TO 20
7	12	58482	SCREW 4-40 X 3/8 BHSCS
8	6	67050	CONNECTOR SOCKET DBL CRIMP 22-18 AWG .250 X .032 RED
N/S	12in	67127	WIRE 20 AWG RED CU STRAND TYPE MTW
N/S	12in	67136	WIRE 20 AWG BLUE CU STRAND TYPE MTW
9	3	67163	RECEPTACLE FLANGED 4 PIN
10	4	67482	CONTACT SOCKET AWG 18-16 CRIMP
11	1	67583	BOX MACHINED ALUM
12	1	67667	CORD GRIP 1/2 IN NPT
13	1	70112	ASSY COIL CORD
14	1	71177	WELDMENT CLAMP RADIAL ARM

## BAR HOLDER MOUNT FIXED PLACE

70107

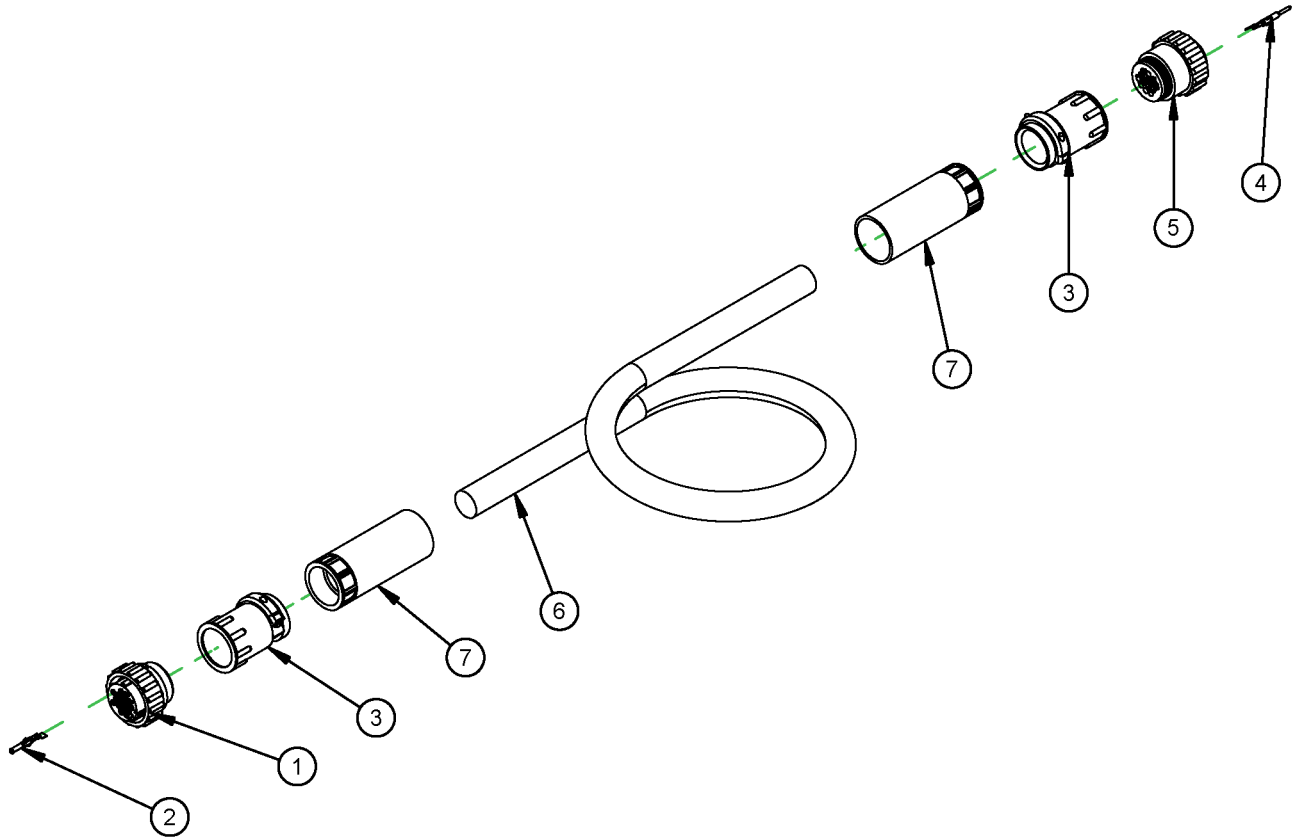


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	58576	CONNECTOR PLUG 17-14 PLASTIC
3	7	67155	TERMINAL PIN 18-16 AWG
4	1	67448	CORD RETRACTILE 7 COND

ASSY COIL CORD

70112



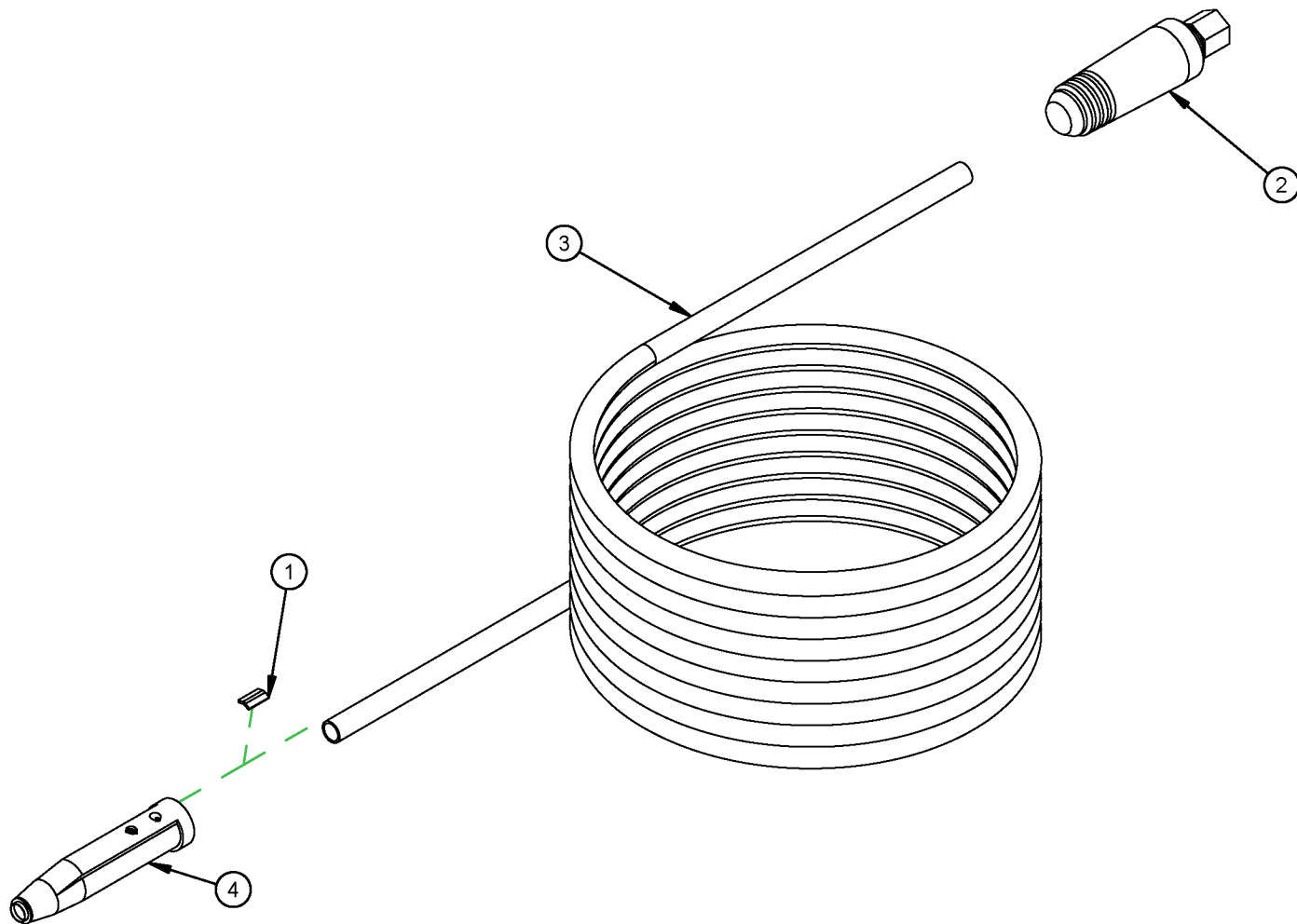


PARTS LIST

ITEM	QTY	P/N:	DESCRIPTION
1	1	47009	CONNECTOR PLUG 17-16 PLASTIC SOCKET INSERT
2	11	47011	CONTACT SOCKET AWG 24 TO 20
3	2	47012	CLAMP CABLE SIZE 17 PLASTIC
4	13	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
5	1	58576	CONNECTOR PLUG 17-14 PLASTIC
6	1	67211	CABLE 12/18 RUBBER JKT
7	2	67274	BOOT CABLE HEATSHRINK SIZE 17

ASSY CABLE CONTROL 25' 306-P

70108



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	36812	INSERT WELDING CABLE CLAMP
2	1	67212	CONNECTOR POWER CABLE XMT MALE
3	1	67455	CABLE WELDING #1/0
4	1	39089	CONNECTOR FEMALE POWER MATES TO A PART NUMBER 61088

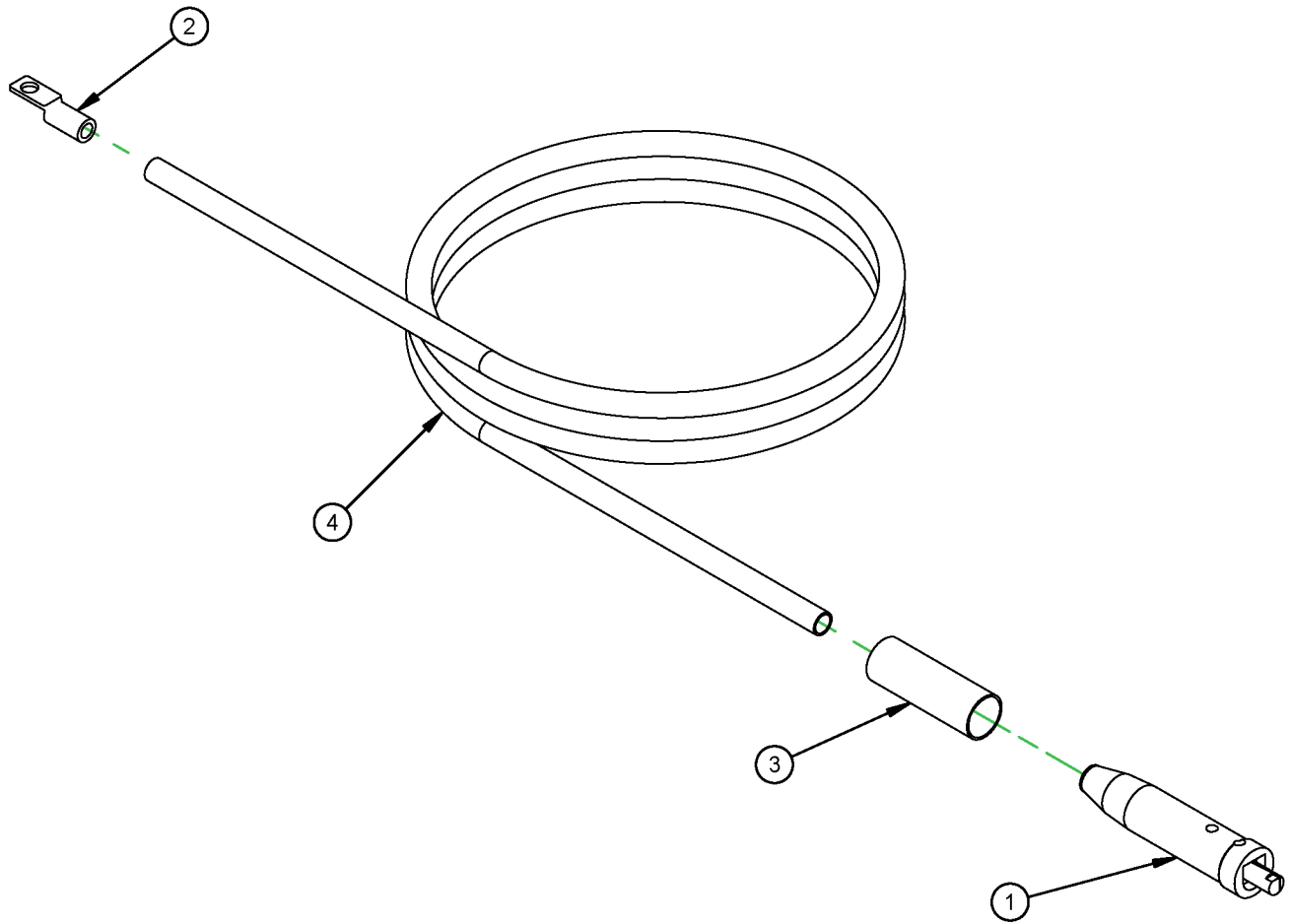
CABLE WELD POWER POSITIVE #1/0 SUPPLY

70109



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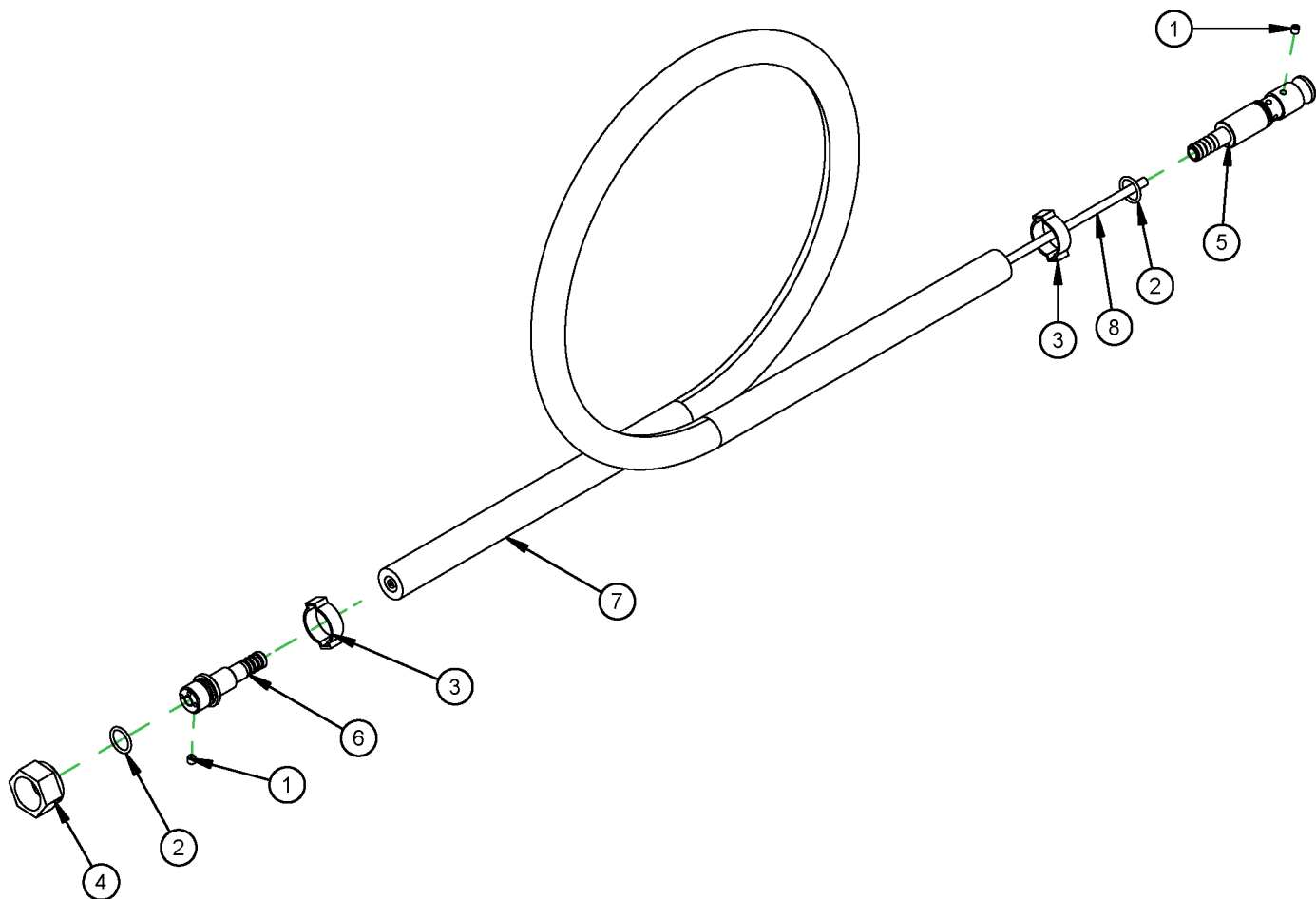
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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67159	CONNECTOR POWER MALE
2	1	67415	LUG CABLE #1/0
3	1	67255	HEAT SHRINK TUBING .315-.945 BLACK
4	1	67455	CABLE WELDING #1/0

ASSY CABLE WELD TORCH

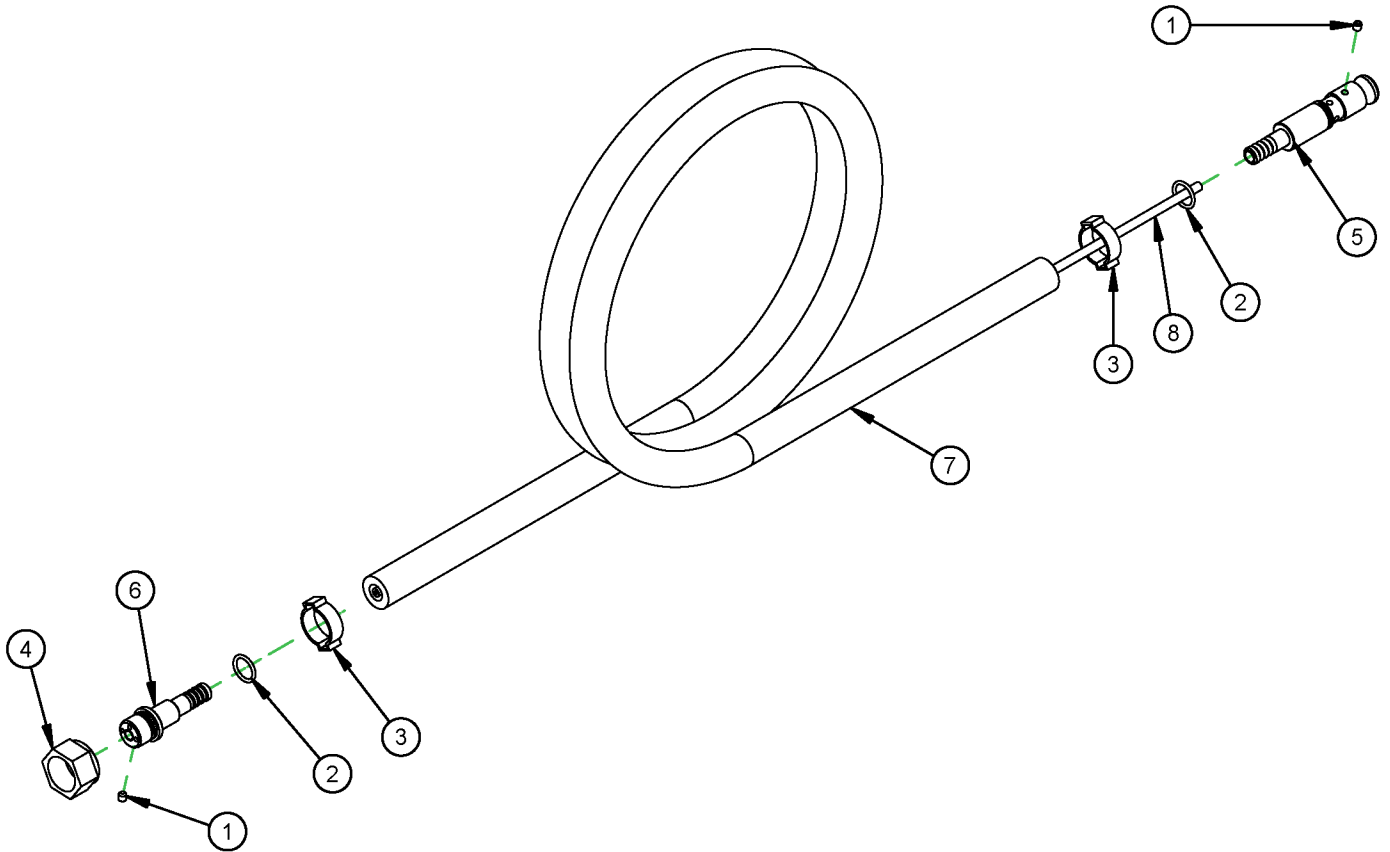
70110



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10841	SCREW 8-32 X 3/16 SSSCP
2	2	10840	RING O 1/16 X 1/2 ID X 5/8 OD (VMI)
3	2	40549	CLAMP HOSE 3/4 DIA DBL PINCH
4	1	66987	NUT CONDUIT SPINDLE UNION
5	1	67423	NIPPLE CONDUIT FEEDER END BW5000
6	1	67424	FTG CONDUIT SPINDLE UNION BW5000
7	48in	40550	HOSE HYDRAULIC 3/8 HIGH PRESSURE
8	52.5in	67599	LINER PLATED MUSIC WIRE .188 OD X .076 ID

CONDUIT 48" WIRE FEED

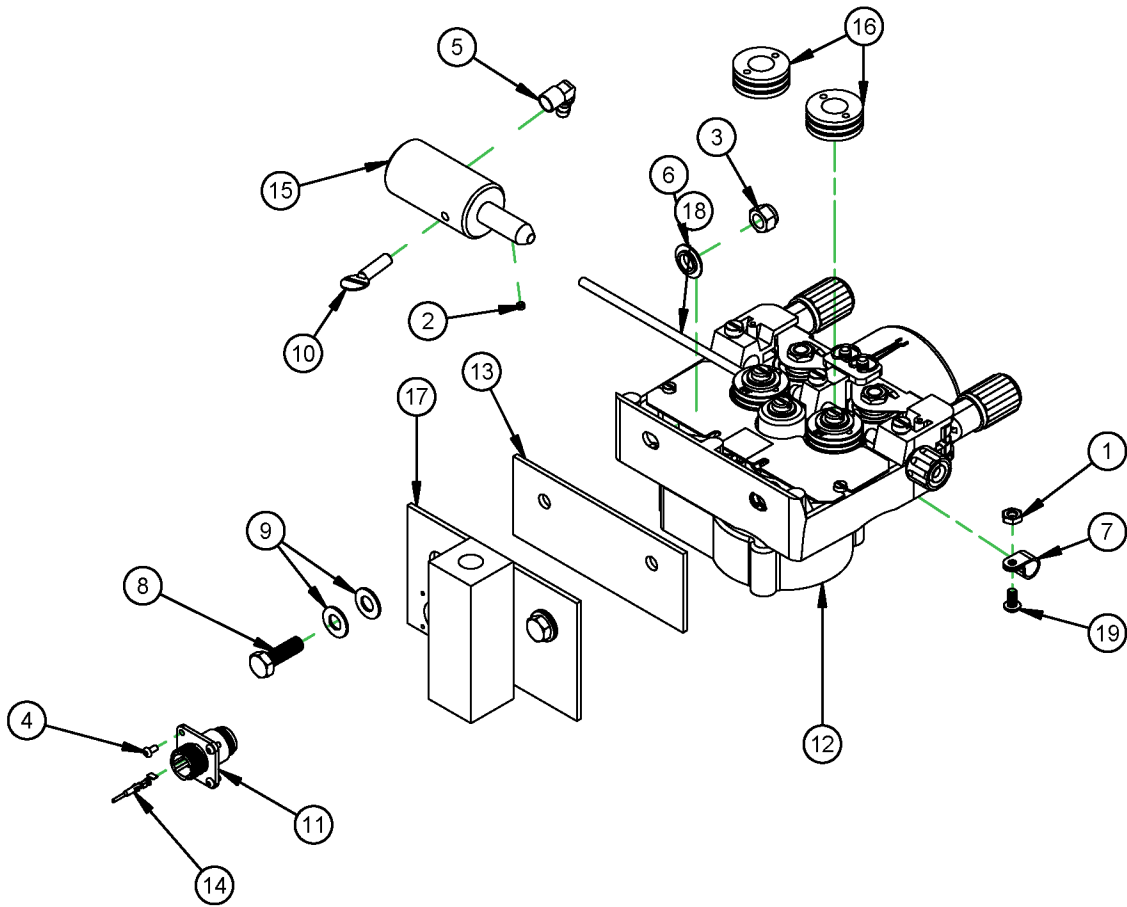
70113



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10841	SCREW 8-32 X 3/16 SSSCP
2	2	10840	RING O 1/16 X 1/2 ID X 5/8 OD (VMI)
3	2	40549	CLAMP HOSE 3/4 DIA DBL PINCH
4	1	66987	NUT CONDUIT SPINDLE UNION
5	1	67423	NIPPLE CONDUIT FEEDER END BW5000
6	1	67424	FTG CONDUIT SPINDLE UNION BW5000
7	1	40550	HOSE HYDRAULIC 3/8 HIGH PRESSURE
8	1	67599	LINER PLATED MUSIC WIRE .188 OD X .076 ID

CONDUIT 72" WIRE FEED

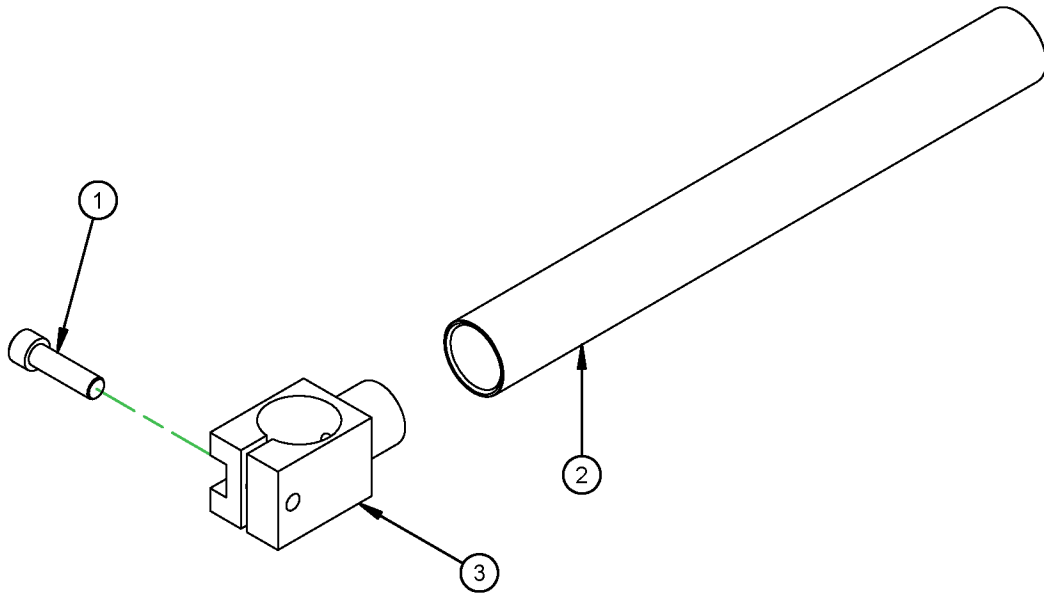
70114



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10837	NUT 10-32 STDN ZINC PLATED
2	1	11058	SCREW 8-32 X 1/8 SSSCP
3	2	19729	NUT 5/16-18 NYLON INSERT LOCKN
4	4	37397	SCREW 4-40 X 1/4 BHSCS
5	1	48791	SP FTG BARB 1/8NPTM X 1/4 HOSE 90 DEG BRASS
6	2	61268	WASHER SHLDR SPACER 3/8 BLACK NYLON
7	1	62485	CLAMP 1/4 CABLE PLASTIC LOOP
8	2	67034	SCREW 5/16-18 X 1 HHCS BLK OX
9	4	67037	WASHER 5/16 FLTW SAE BLK OX
10	1	67059	THUMBSCREW 1/4-20 X 3/4 NO SHOULDER
11	1	67063	CONNECTOR PLUG 11-4 PLASTIC
12	1	67074	FEED MECHANISM WIRE FEEDER WITH FEED ROLLS
13	1	67075	ISOLATOR FEED MECHANISM
14	2	67155	TERMINAL PIN 18-16 AWG
15	1	67422	FITTING CONDUIT FEEDER BW5000
16	2	67453	FEED ROLL V-GROOVE .045/.062
17	1	67489	ADAPTER WIRE FEEDER PORTABLE
18	2in	67599	LINER PLATED MUSIC WIRE .188 OD X .076 ID
19	1	67665	SCREW 10-32 X 3/8 SLOTTED RHMS

## WIREFEEDER PORTABLE W/ .045/.062 ROLLS BW5000

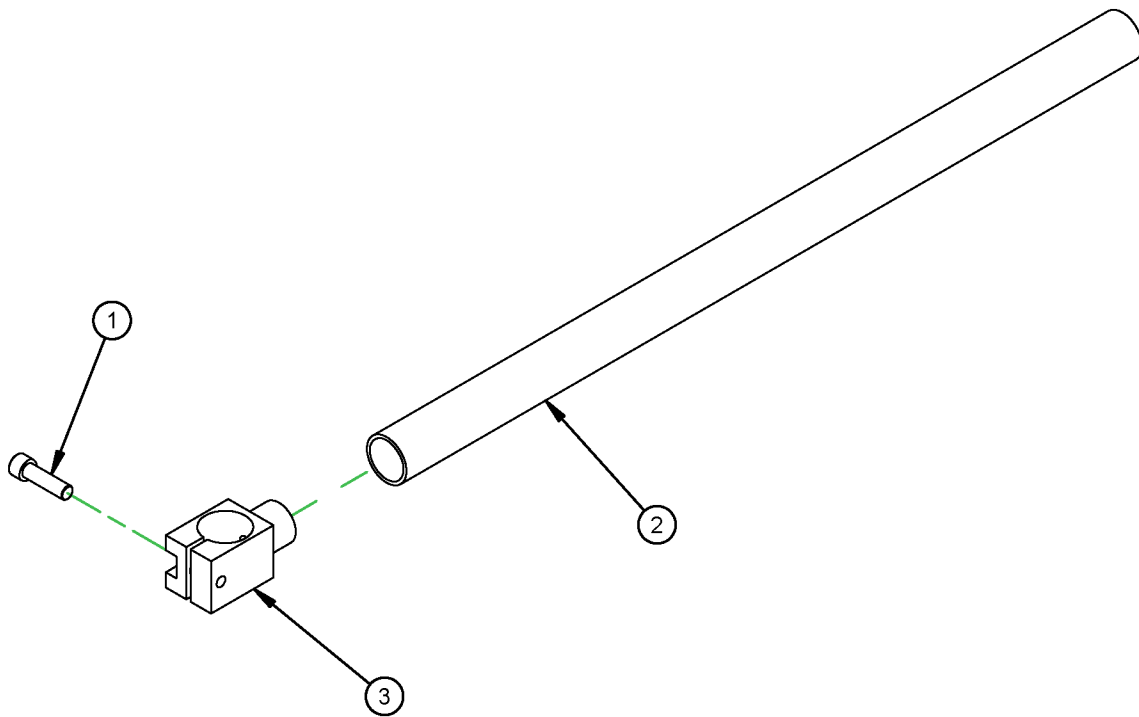
70117



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	17131	SCREW 1/4-20 X 7/8 SHCS
2	1	67035	TUBE TORCH TRAMMEL
3	1	67002	CLAMP TORCH TRAMMEL BW3000

ROD CLAMPING TORCH SUPPORT 8"

70118

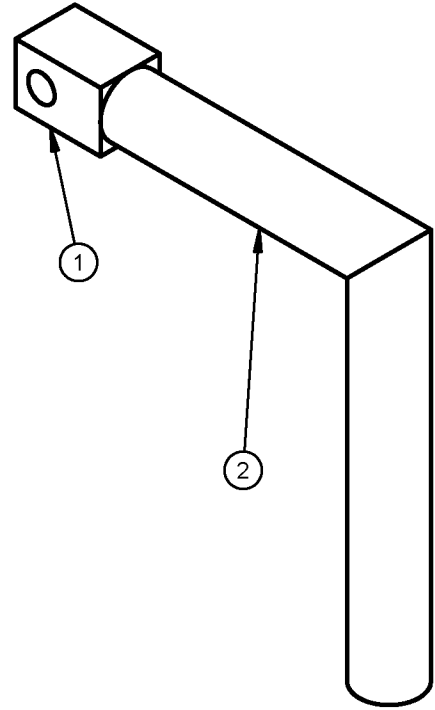
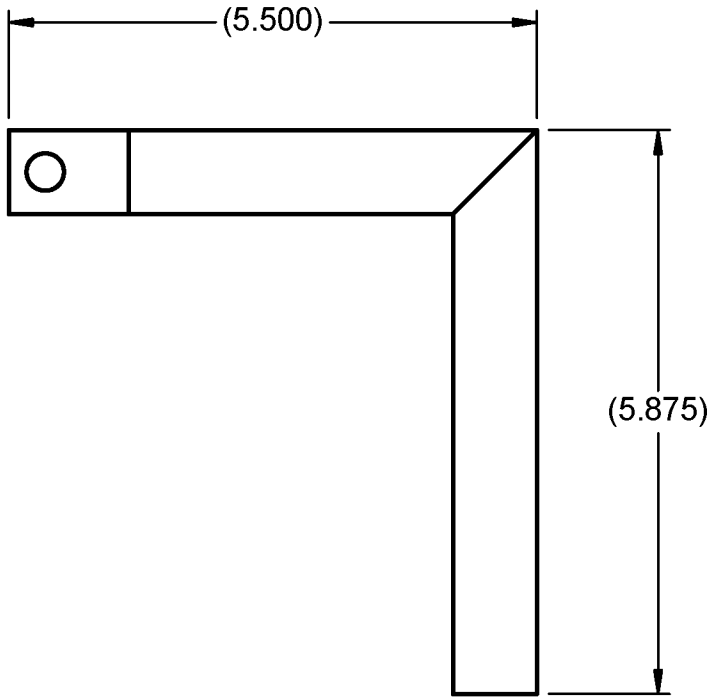


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	17131	SCREW 1/4-20 X 7/8 SHCS
2	1	66998	TUBE EXTENSION 18 IN (KB)
3	1	67002	CLAMP TORCH TRAMMEL BW3000

ROD CLAMPING TORCH SUPPORT 16"

70119

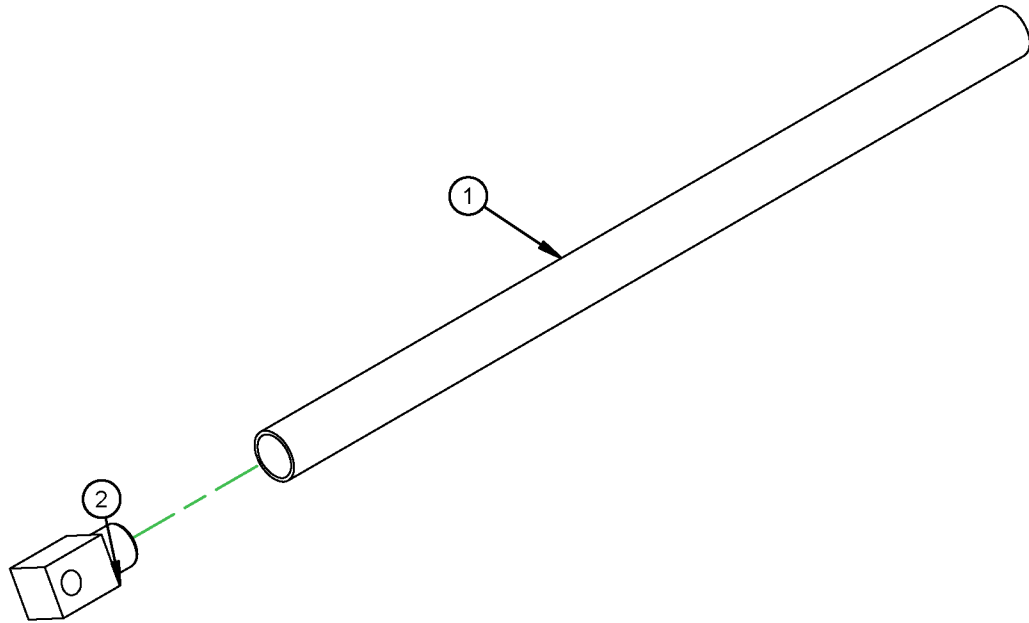




PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67457	FTG END TORCH HOLDER
2	1	72198	TUBE EXTENSION 90 DEG BEND

ROD TORCH SUPPORT 90 DEG BEND

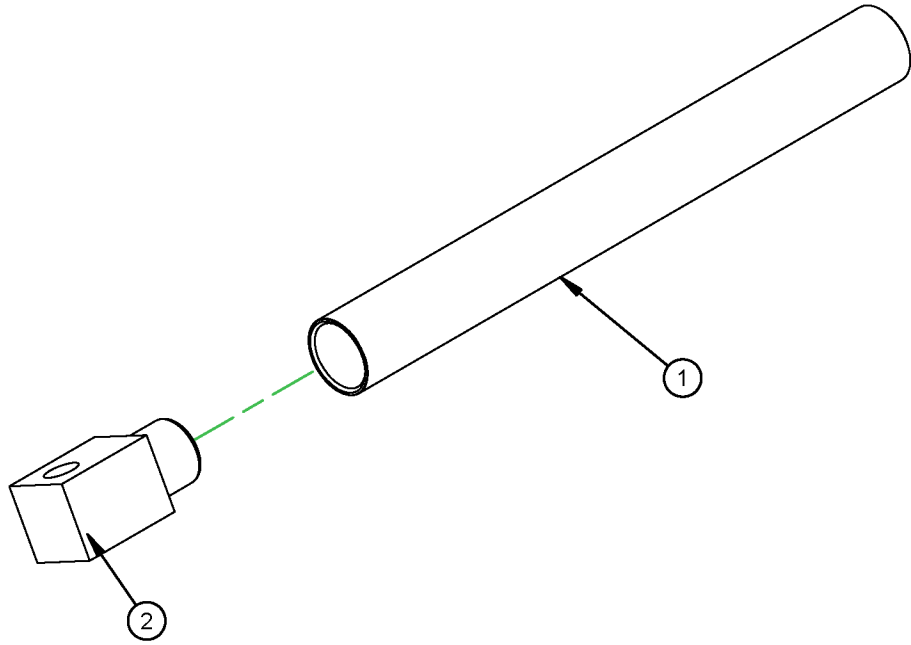
70120



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	66998	TUBE EXTENSION 18 IN (KB)
2	1	67457	FTG END TORCH HOLDER

SUPPORT TORCH 16"/410MM

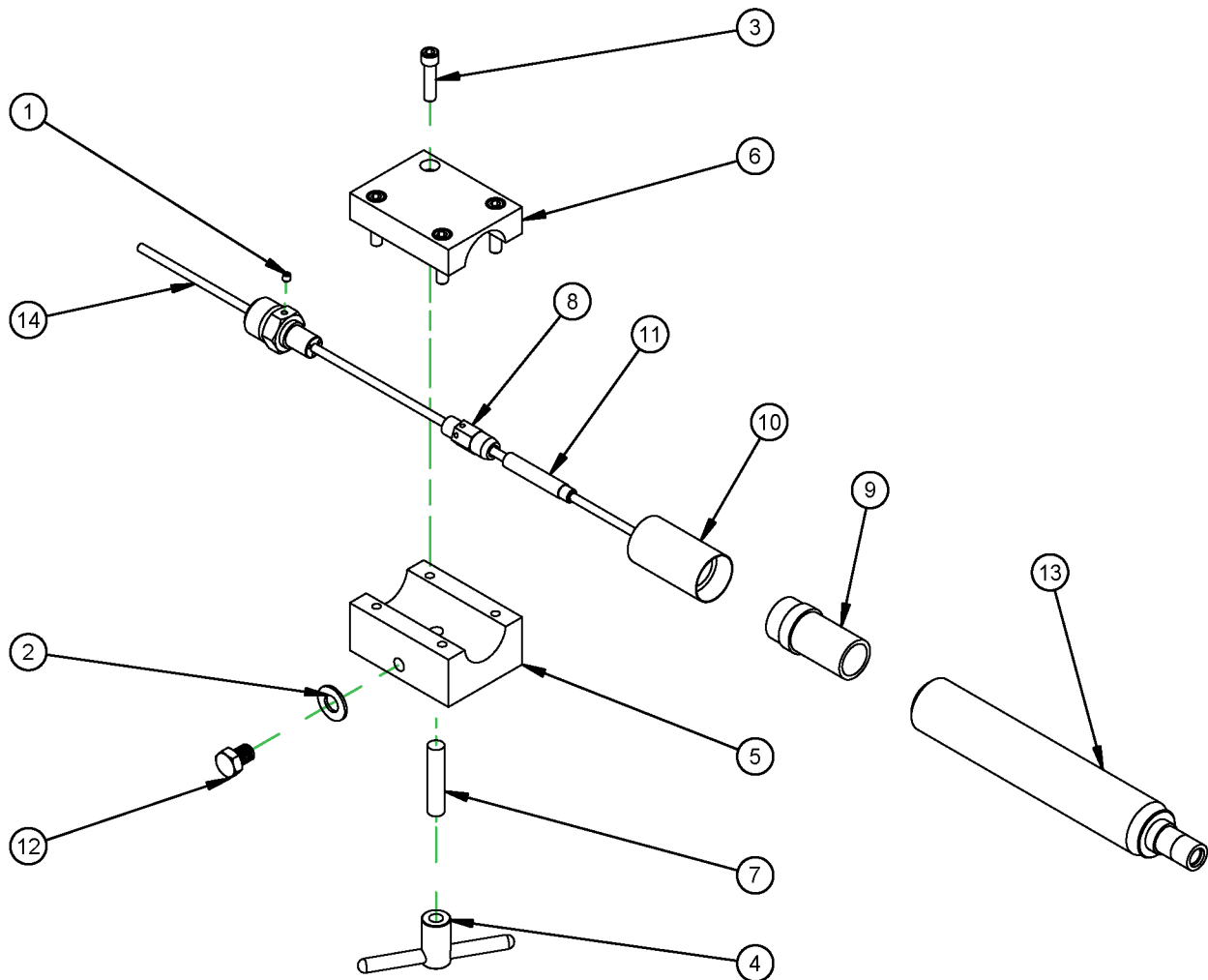
70122



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67035	TUBE TORCH TRAMMEL
2	1	67457	FTG END TORCH HOLDER

SUPPORT TORCH 8"/200MM

70123



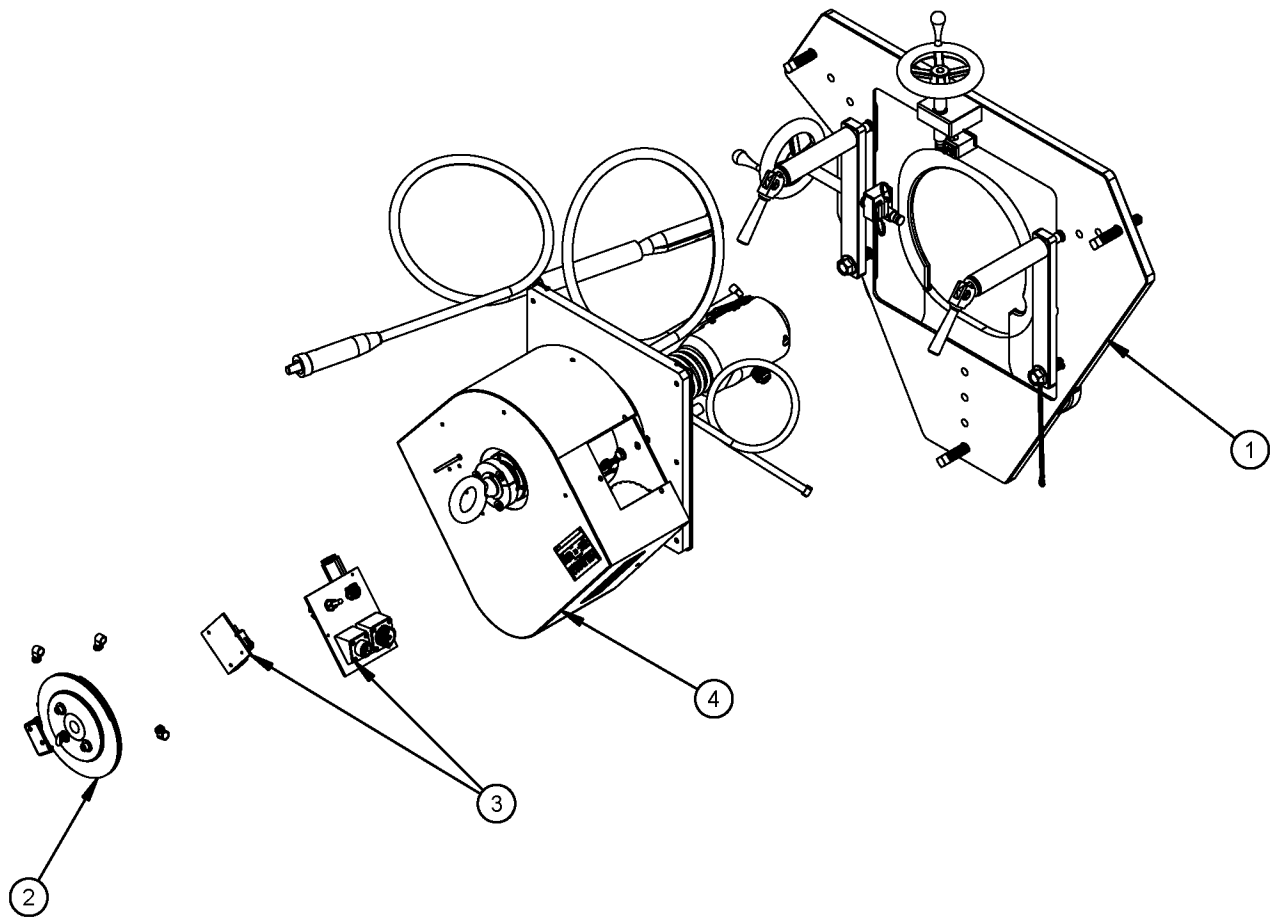
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10841	SCREW 8-32 X 3/16 SSSCP
2	1	11080	WASHER 3/8 FLTW SAE
3	4	11118	SCREW 1/4-20 X 1 SHCS
4	1	67396	HANDLE TORCH CLAMP
5	1	67397	BODY TORCH ADAPTER
6	1	67399	CAP TORCH ADAPTER
7	1	67477	STUD 3/8-16 SELF LOCKING
8	1	67547	DIFFUSER GAS MIG GUN
9	1	67548	NOZZLE MIG GUN
10	1	67549	INSULATOR MIG GUN
11	1	67555	TIP CONTACT .045 MIG GUN
12	1	67640	SCREW 3/8-16 X 1/2 HHCS
13	1	70124	BODY TORCH WITH FTG ONLY 2ND GEN BW5000
14	1	67599	LINER PLATED MUSIC WIRE .188 OD X .076 ID

TORCH STD 2ND GEN BW5000

70126



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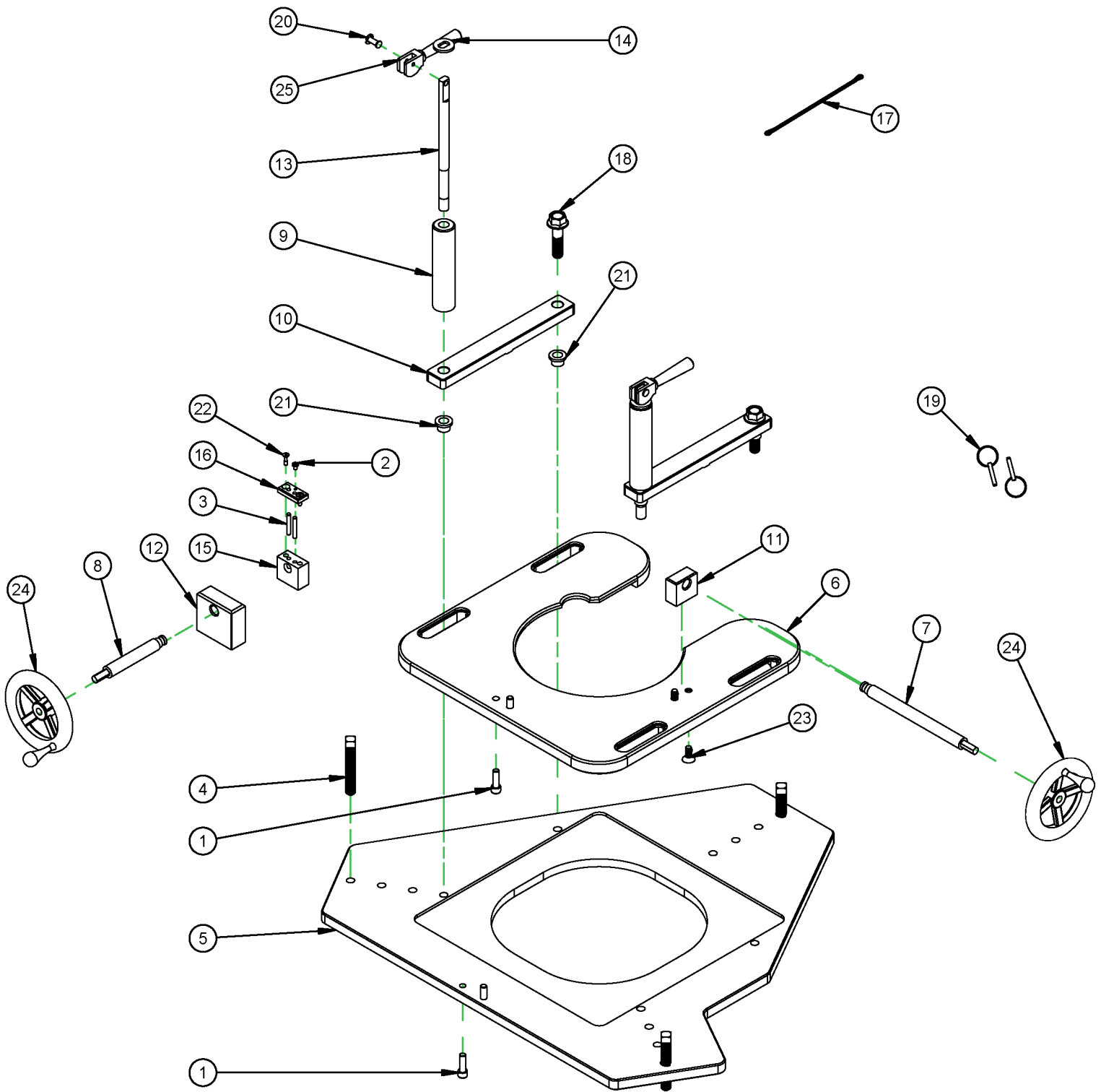
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	70101	ASSY PLATE MTG WITH X-Y ADJ
2	1	70102	BW5000 AUTO-SKIP
3	1	70116	NON ENCODER 1200 X-Y VERSION
4	1	70212	HEAD BASIC BW5000

HEAD COMPLETE BW5000 NON ENCODER AUTO-SKIP X-Y  
ADJ

70192

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ASSY PLATE MTG WITH X-Y ADJ

70101

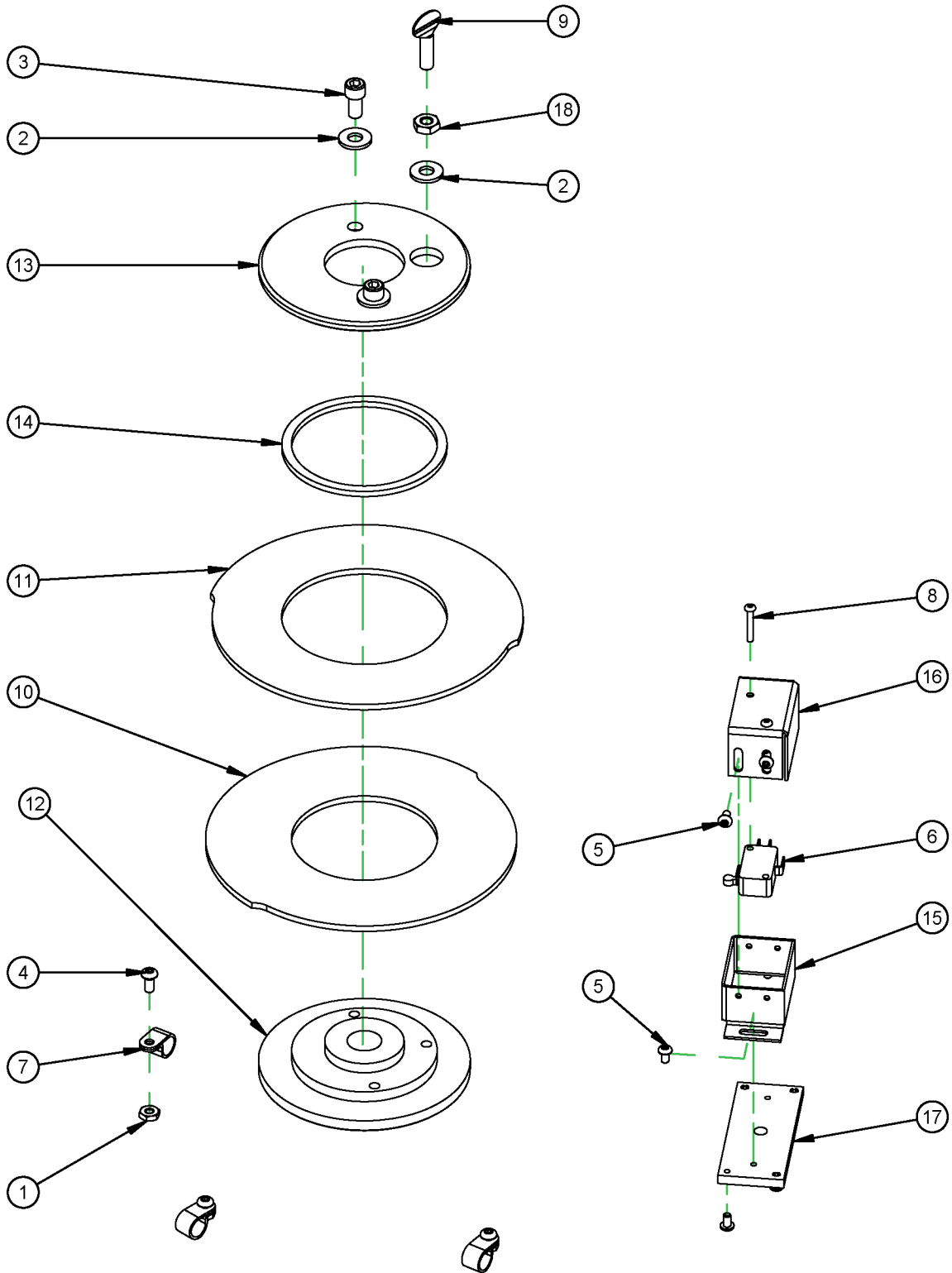
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10431	SCREW 5/16-18 X 1 SHCS
2	1	10839	SCREW 8-32 X 1/4 BHSCS
3	2	19735	PIN DOWEL 3/16 DIA X 1-1/4
4	3	39461	SCREW 1/2-13 X 3 SQHSSCP
5	1	67601	PLATE BASE MOUNT & LEVEL X-Y ADJUST BW5000
6	1	67603	PLATE SLIDE HORSE SHOE X-Y SLIDE TABLE BW5000
7	1	67606	ROD THREADED ACME 5/8 X 6 IN X-Y SLIDE
8	1	67608	ROD THREADED ACME 5/8 X 6 IN X-Y SLIDE BW5000
9	2	67617	SPACER HOLD DOWN X-Y SYSTEM BW5000
10	2	67618	BAR PRESSURE X-Y POS CLAMP BW5000
11	1	67619	BLOCK ANCHOR THREADED X-Y SYSTEM 1.38 IN BW5000
12	1	67620	BLOCK ANCHOR THREADED X-Y SYSTEM 2.31 IN BW5000
13	2	67622	ROD CLAMPING CAM LEVER X-Y SYSTEM BW5000
14	2	67625	WASHER DOUBLE D X-Y QUICK CLAMP BW5000
15	1	67626	BLOCK ANCHOR THREADED X-Y SLIDE SYSTEM BW5000
16	1	67627	PIN HOLDER ANCHOR BLOCK
17	1	67688	LANYARD EYE/EYE 3/64 DIA X 6 IN LONG
18	2	67694	SCREW 1/2-13 X 2 HHCS FLANGED
19	2	67708	PIN QUICK RELEASE 3/16 X .80 RING GRIP
20	2	67714	PIN CLEVIS 1/4 DIA X 3/4 WITH E-RING
21	4	67719	BUSHING FLANGED 1/2 ID X 5/8 OD X 1/2
22	2	68213	SCREW MODIFIED 8-32 X 5/8 FHSCS
23	2	68531	SCREW 5/16-18 X 3/4 FHSCS SELF LOCKING NYLON PATCH
24	2	70137	HANDWHEEL 4-1/2 DIA X 3/8 BORE
25	2	70658	CAM HANDLE DOUBLE 1/4 IN BORE

ASSY PLATE MTG WITH X-Y ADJ

70101







BW5000 AUTO-SKIP

70102

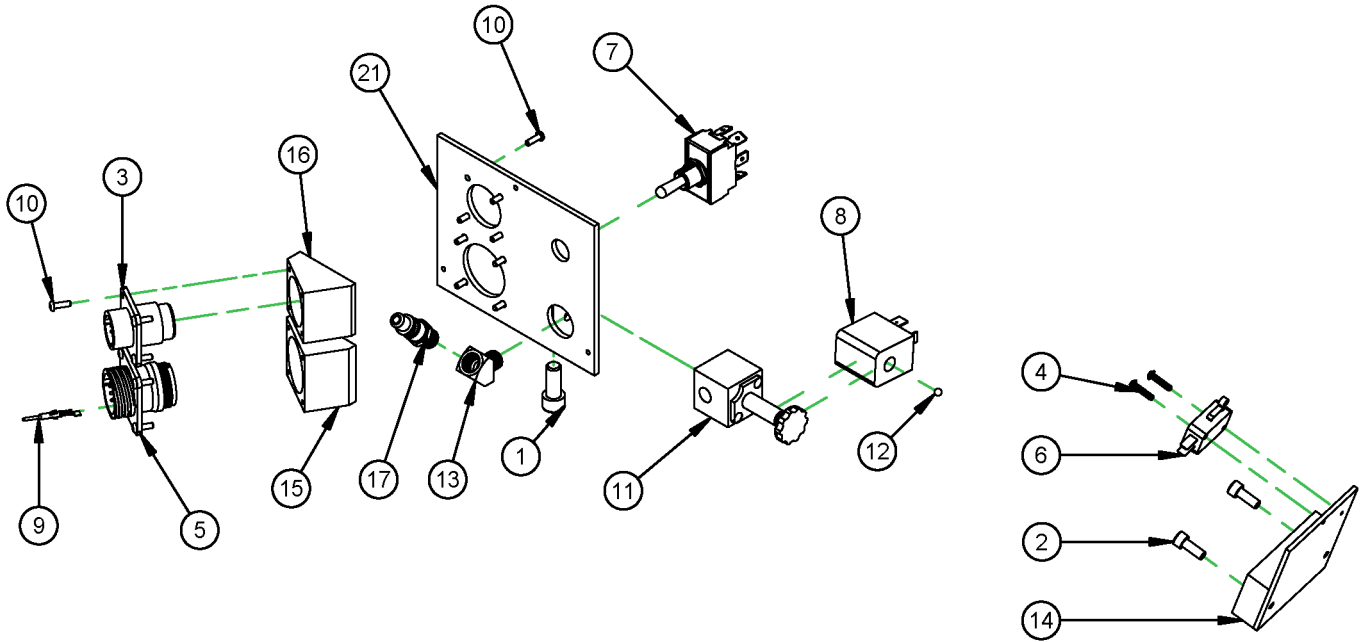
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	10343	NUT 8-32 STDN ZINC PLATED
2	3	10702	WASHER 1/4 FLTW SAE
3	2	10800	SCREW 1/4-20 X 1/2 SHCS
4	3	11359	SCREW 8-32 X 3/8 BHSCS
5	10	12599	SCREW 6-32 X 1/4 BHSCS
6	1	37407	SWITCH STEP LIMIT
7	3	62485	CLAMP 1/4 CABLE PLASTIC LOOP
8	2	62487	SCREW 4-40 X 3/4 BHSCS
9	1	67059	THUMBSCREW 1/4-20 X 3/4 NO SHOULDER
10	1	67586	CAM LOWER AUTOSKIP
11	1	67587	CAM UPPER AUTOSKIP
12	1	67590	HUB AUTOSKIP
13	1	67591	PLATE CLAMP AUTOSKIP
14	1	67592	RING HUB AUTOSKIP
15	1	67593	BRACKET BASE AUTOSKIP BW5000
16	1	67595	BRACKET SWITCH AUTOSKIP BW5000
17	1	67596	PLATE MOUNT AUTOSKIP BW5000
18	1	71568	NUT 1/4-20 JAMN BLK OX

BW5000 AUTO-SKIP

70102



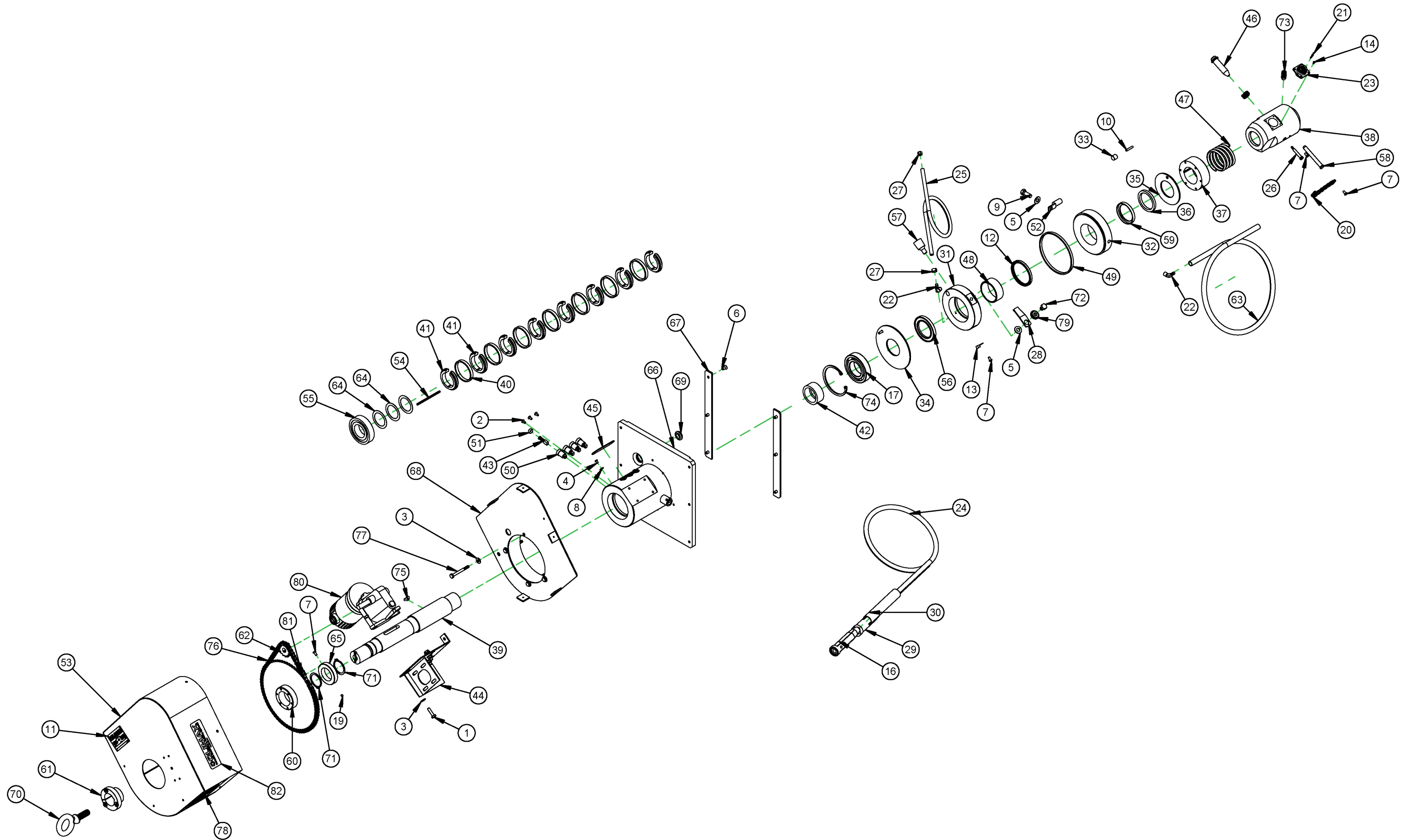
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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10657	SHCS 5/16-18 X 3/4
2	2	10877	SCREW 10-32 X .5 SHCS
3	1	17919	RECEPTACLE FLANGED 9 MALE CONTACTS SIZE 13
4	2	23009	SCREW 4-40 X 1/2 BHCS
5	1	33988	RECEPTACLE 14 PIN PLASTIC FLANGE
6	1	37407	SWITCH STEP LIMIT
7	1	40520	SWITCH SPDP 15/32" HOLE DIA
8	1	51617	SOLENOID COIL 24 VOLT
9	16	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
10	16	58482	SCREW 4-40 X 3/8 BHSCS
11	1	65473	SOLENOID BODY 24V
12	1	65474	BALL 5/32 302 SS GRADE 100
13	1	66968	FTG ELBOW 1/8 NPTM X 1/8 NPTF STREET 45 BRASS
14	1	67510	MOUNT STEP SWITCH W/O ENCODER
15	1	67629	CABLE CONNECTOR, 14 PIN ~ANGLE BLOCK~1202 CONNECT PANEL
16	1	67630	CABLE CONNECTOR, 9 PIN ~ANGLE BLOCK~1202 CONNECT PANEL
17	1	69332	FTG QUICK COUPLER 1/4B 1/8 NPT MALE AIR

NON ENCODER 1200 X-Y VERSION

70116



HEAD BASIC BW5000

70212

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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	10220	SCREW 1/4-20 X 1 HHSC
2	5	10560	SCREW 10-32 X 3/8 FHSCS
3	10	10702	WASHER 1/4 FLTW SAE
4	2	10839	SCREW 8-32 X 1/4 BHSCS
5	2	11080	WASHER 3/8 FLTW SAE
6	6	11675	SCREW 1/4-20 X 1/2 FHSCS
7	5	11678	SCREW 10-32 X 3/8 BHSCS
8	2	11872	WASHER #8 FLTW SAE
9	1	13812	SCREW 3/8-16 HHCS
10	2	14284	PIN DOWEL 3/16 DIA X 1
11	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
12	1	32696	SEAL 2.500 ID X 3.000 OD X .250
13	2	32697	TERMINAL RING 22-16AWG #10/M4.5 STUD
14	4	37397	SCREW 4-40 X 1/4 BHSCS
15	1	37407	SWITCH STEP LIMIT
16	1	39089	CONNECTOR FEMALE POWER MATES TO A PART NUMBER 61088
17	1	39160	BRG BALL 1.7717 ID X 3.3465 OD X .748
18	1	40477	SPRING COMP .845 OD X .067 WIRE X .875
19	1	44800	SCREW 10-32 X 3/8 SSSFP
20	8	45196	CHAIN SASH SIZE 35 .035 THICK 100 LBS
21	8	47011	CONTACT SOCKET AWG 24 TO 20
22	3	48791	SP FTG BARB 1/8NPTM X 1/4 HOSE 90 DEG BRASS
23	1	58580	RECEPTACLE FLANGED 14 PIN AMP
24	1	64063	HOSE 1/4 ID X 1/2 OD
25	1	67031	TUBING 1/4 ID 3/8 OD PVC CLEAR
26	1	67052	SCREW .250 DIA X 1-1/4 X 10-24 SHLDCS
27	2	67064	CLAMP HOSE 3/8 DIA DBL PINCH STEEL
28	1	67103	LUG CABLE WELDING #2
N/S	49in	67122	WIRE 20 AWG BROWN CU STRAND TYPE MTW
N/S	34in	67123	WIRE 20 AWG RED CU STRAND TYPE MTW
N/S	34in	67124	WIRE 20 AWG ORANGE CU STRAND TYPE MTW
N/S	49in	67125	WIRE 20 AWG YELLOW CU STRAND TYPE MTW
N/S	25in	67127	WIRE 20 AWG GREEN CU STRAND TYPE MTW
N/S	46in	67130	WIRE 20 AWG VIOLET CU STRAND TYPE MTW
N/S	25in	67132	WIRE 20 AWG GRAY CU STRAND TYPE MTW
N/S	19in	67133	WIRE 20 AWG WHITE CU STRAND TYPE MTW
N/S	41in	67134	WIRE 20 AWG BLACK CU STRAND TYPE MTW
N/S	34in	67136	WIRE 20 AWG BLUE CU STRAND TYPE MTW
29	1	67159	CONNECTOR POWER MALE
30	1	67255	HEAT SHRINK TUBING .315-.945 BLACK
31	1	67344	CONNECTOR ROT POWER HEAD
32	1	67345	CONNECTOR ROT POWER SLIP
33	2	67361	INSULATOR ROT PC DOWEL
34	1	67362	INSULATOR PC HEAD
35	1	67363	INSULATOR PC SLIP
36	1	67364	INSULATOR PC RADIAL
37	1	67366	BLOCK PC SPRING
38	1	67368	COUPLING LINE BAR
39	1	67369	SPINDLE HEAD
40	7	67370	RING SLIP

HEAD BASIC BW5000

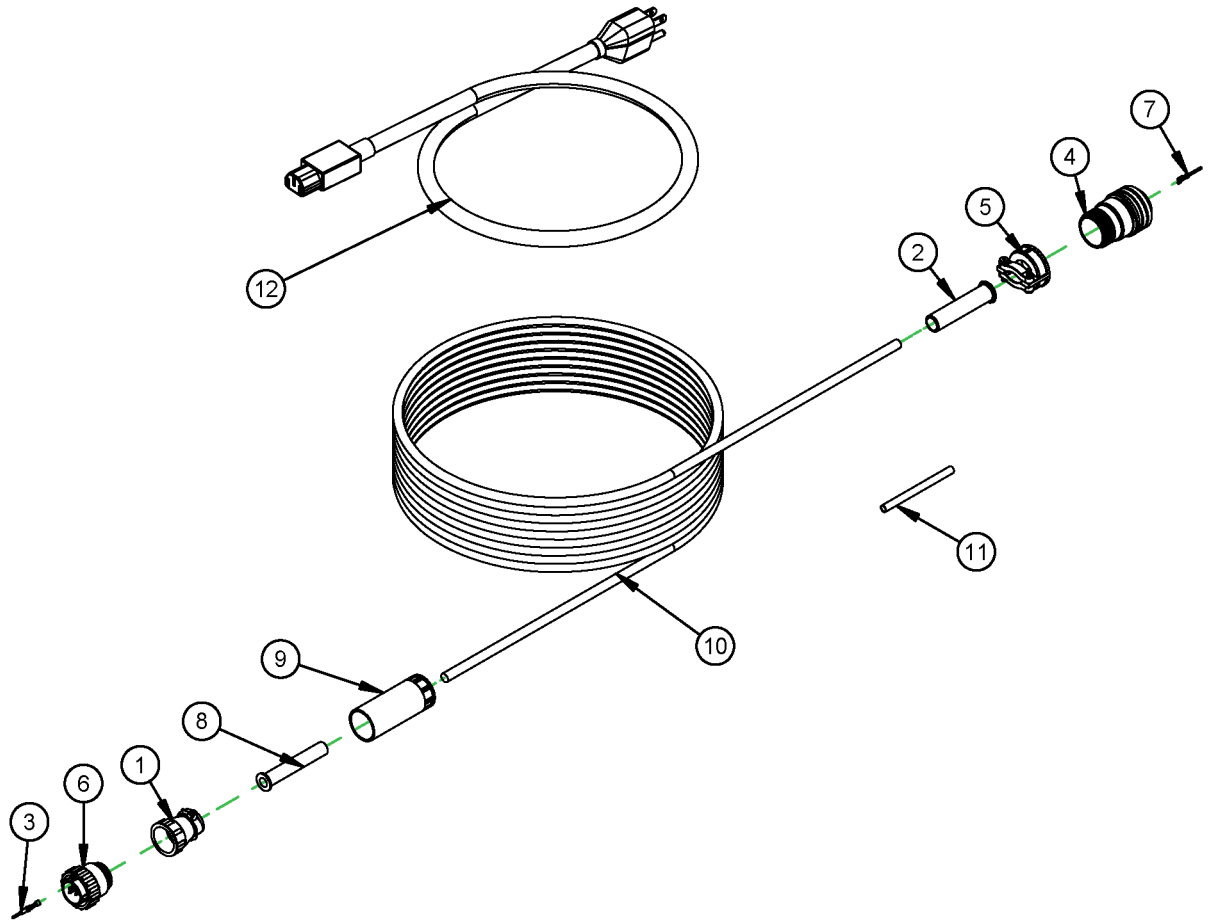
70212



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
41	8	67371	INSULATOR SLIP RING
42	1	67375	SPACER BOTTOM SLIP RING
43	7	67376	BRUSH SLIP RING
44	1	67378	MOUNT MOTOR
45	1	67395	COVER HEAD ACCESS SLOT
46	1	67401	PIN LINE BAR COUPLING KO
47	1	67402	SPRING ROTATABLE PC
48	1	67408	BUSHING ROTATION PC CENTER
49	1	67409	RING ROT PC CONNECTOR
50	7	67411	HOLDER BRUSH
51	7	67414	CAP BRUSH HOLDER
52	1	67415	LUG CABLE #1/0
53	1	67418	SHROUD AUTO SKIP BW5000
54	1	67420	KEY SLIP RING
55	1	67428	BRG BALL 1.5748 ID X 3.1496 OD X .7087 2 SEAL
56	1	67432	SEAL 2.000 ID X 3.000 OD X .313
57	1	67433	CUP GREASE 1/8 NPT
58	1	67435	PIN CLEVIS 3/8 DIA X 3 LONG
59	1	67437	SEAL 2.000 ID X 2.500 OD X .250
60	1	67440	SPROCKET 3/8 PITCH X 70T
61	1	67443	BUSHING SPROCKET
62	1	67444	SPROCKET DRIVE
63	1	67455	CABLE WELDING #1/0
64	3	67456	SHIM SLIP RING
65	1	67509	STEP NIB RING
66	1	67602	HOUSING HEAD ASSY X-Y ADJUST BW5000
67	2	67604	GUIDE TEFLON X-Y SLIDE TABLE BW5000
68	1	67610	SHROUD PAN X-Y TABLE VERSION BW5000
69	1	67634	GROMMET 1/2 ID X 1 OD
70	1	67637	BOLT EYE 5/8-11
71	2	67638	RING SNAP 1-9/16 EXTERNAL
72	1	67640	SCREW 3/8-16 X 1/2 HHCS
73	1	67643	SCREW 1/2-13 X 1 SSSDP
74	1	67645	RING SNAP 3-11/32 ID X .09 TH
75	1	67656	KEY WOODRUFF 3/16 X .740 #606
76	1	67663	CHAIN #35 POWER TRANS
77	4	67684	SCREW 1/4-20 X 2-1/2 HHCS STAINLESS STEEL
78	1	68095	LABEL WARNING ARC 5" x 3-1/2"
79	1	68203	SPACER POWER COUPLING
80	1	70146	GEARMOTOR 90 VDC 47 RPM 26 IN-LBS TORQUE 62:1 TENV
81	1	70218	LINK #35 CHAIN CONNECTING
82	2	70226	LABEL CLIMAX LOGO 1.5 X 5.5

HEAD BASIC BW5000

70212

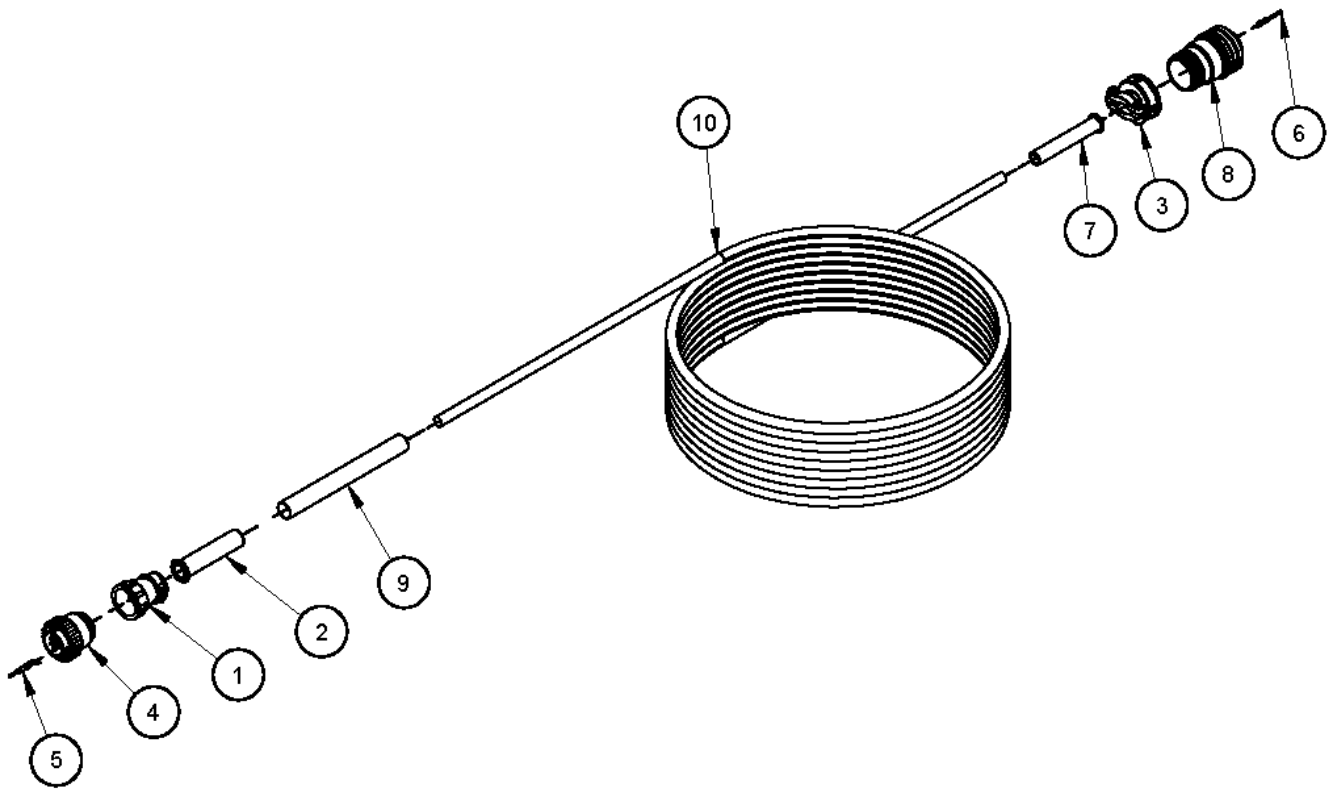


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
4	1	58479	PLUG CONNECTOR 20-14
5	1	58480	CONNECTOR CABLE CLAMP STEP DOWN 20 TO 14 NICKEL PLATED
6	1	58576	CONNECTOR PLUG 17-14 PLASTIC
7	8	67169	CONNECTOR CRIMP PIN MALE 16-22 AWG
8	1	67214	BOOT #6 RUBBER
9	1	67274	BOOT CABLE HEATSHRINK SIZE 17
10	1	67605	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD
11	1	70901	HEAT SHRINK TUBE 3/16 DIA BLACK
12	1	72142	CORD POWER IEC 320 3 FT

**CABLE ASSY POWER SUPPLY MILLER 14 PIN W/ 100V  
PIGTAIL PLASTIC CONNECTORS 25 FT**

29824

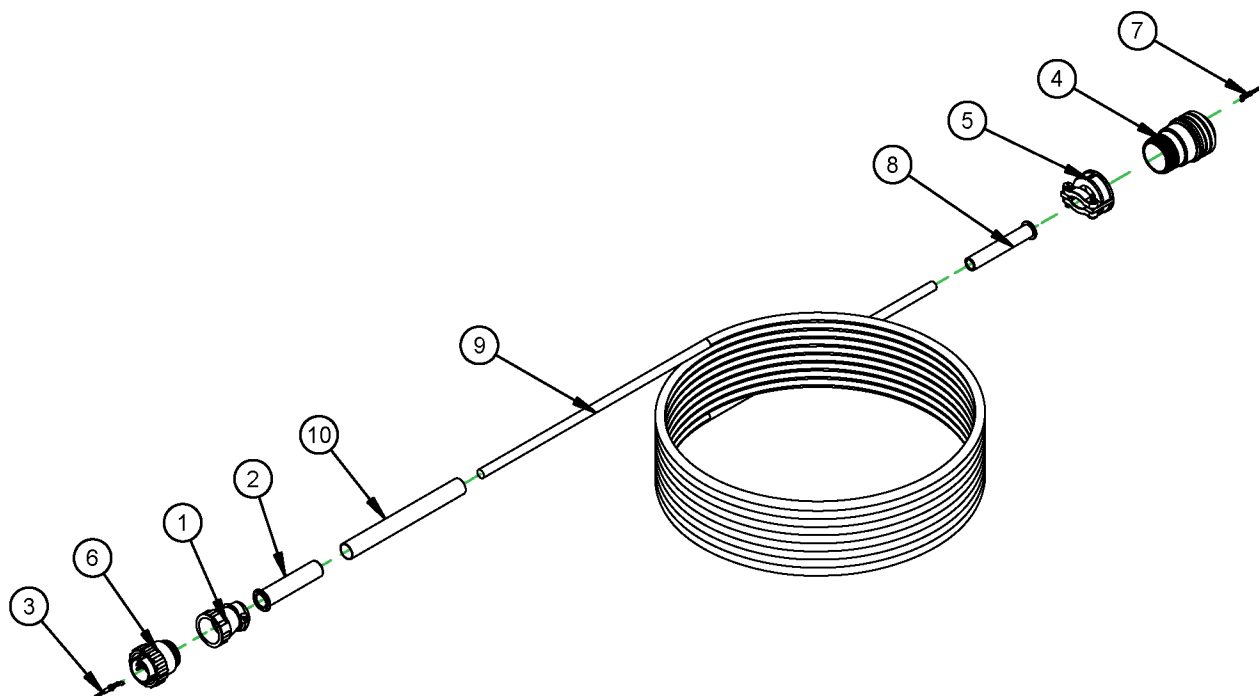




AVAILABLE CONFIGURATION		
PART NO.	DESCRIPTION	P/N 83988 QTY
32042	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 25 FT	301"
44232	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 50 FT	601"
47767	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 75 FT	901"
47766	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 100 FT	1201"

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	1	58480	CONNECTOR CABLE CLAMP STEP DOWN 20 TO 14 NICKEL PLATED
4	1	58576	CONNECTOR PLUG 17-14 PLASTIC
6	5	67169	CONNECTOR CRIMP PIN MALE 16-22 AWG
7	1	67214	RUBBER BUSHING FOR MS3057A CABLE CLAMP .312 ID
10	CHART	83988	CORD TYPE SOOW 18 AWG 5 COND 600V .325 OD UNSHIELDED GRAY JACKET
8	1	67298	CONNECTOR V300 14 PIN KEY
9	1	70655	TUBING HEAT SHRINK .5 ID 2:1 SHRINK RATIO CLEAR
5	7	67155	TERMINAL PIN 18-16 AWG
10	1	67295	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD

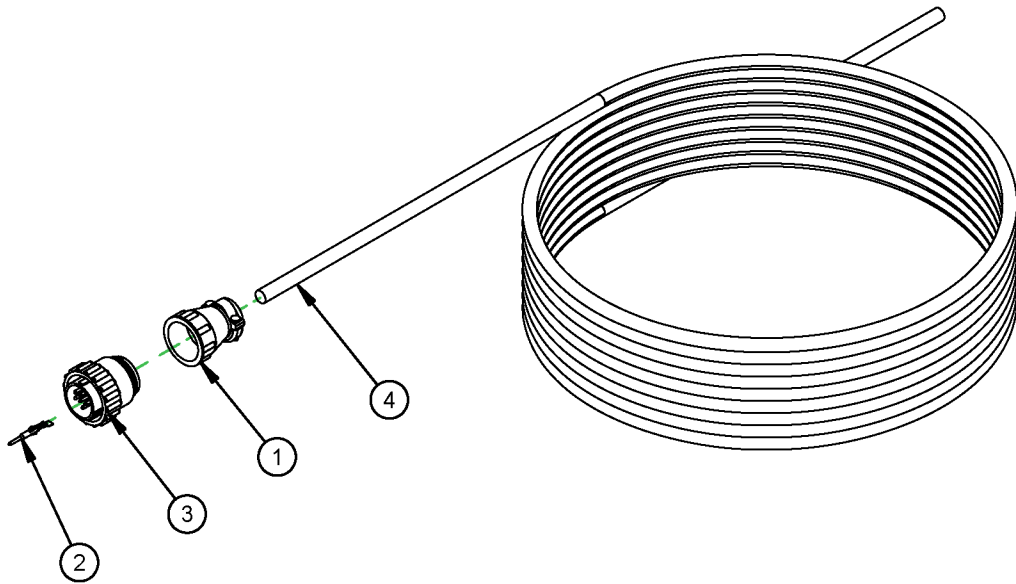
72101 - CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 25 FT - REV B  
 FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
4	1	58479	PLUG CONNECTOR 20-14
5	1	58480	CONNECTOR CABLE CLAMP STEP DOWN 20 TO 14 NICKEL PLATED
6	1	58576	CONNECTOR PLUG 17-14 PLASTIC
7	5	67169	CONNECTOR CRIMP PIN MALE 16-22 AWG
8	1	67214	BOOT #6 RUBBER
9	1	67296	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD
10	1	70655	HEAT SHRINK TUBE 1/2 DIA CLEAR

**CABLE ASSY POWER SUPPLY MILLER XMT 14 PIN PLASTIC  
CONNECTORS 25 FT**

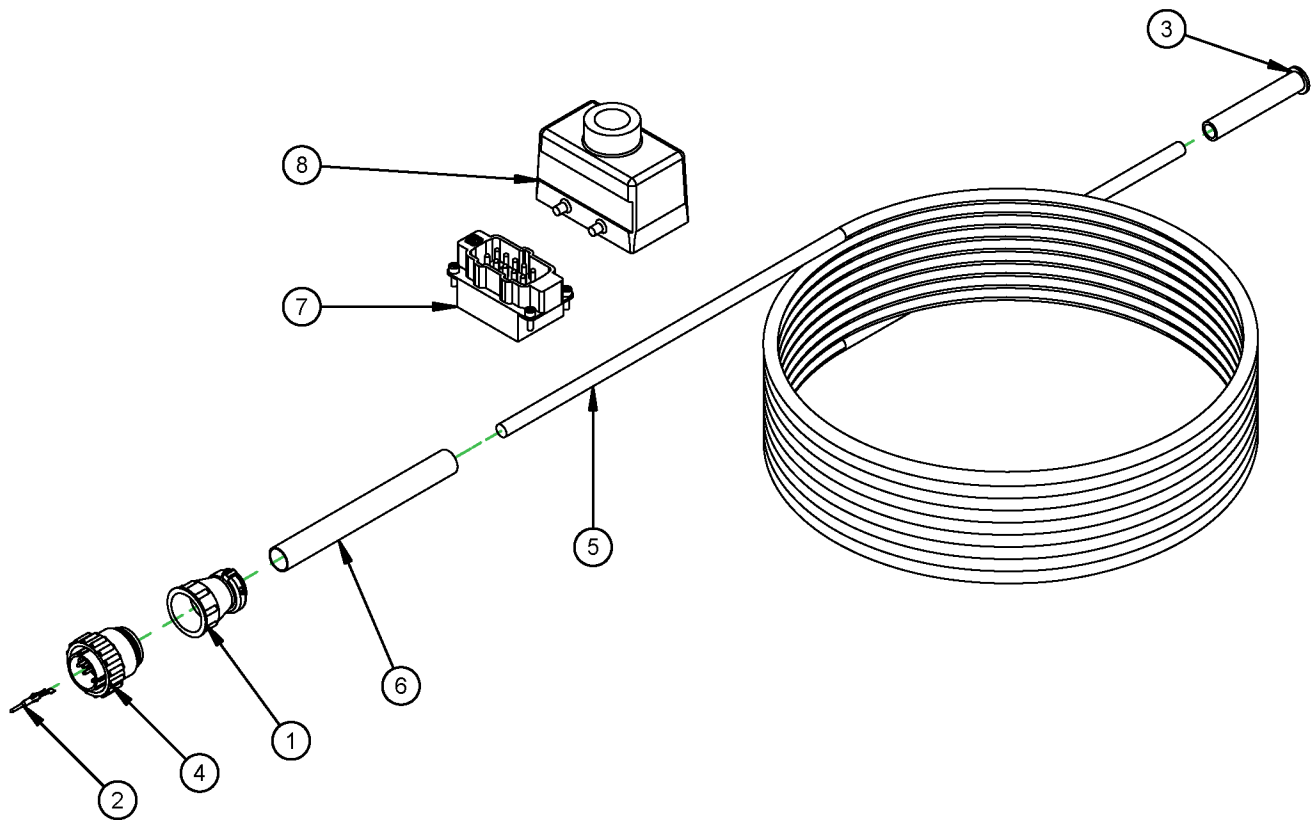
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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
3	1	58576	CONNECTOR PLUG 17-14 PLASTIC
4	1	67296	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD

CABLE ASSY POWER SUPPLY BLANK ONE END PLASTIC  
CONNECTORS 25FT

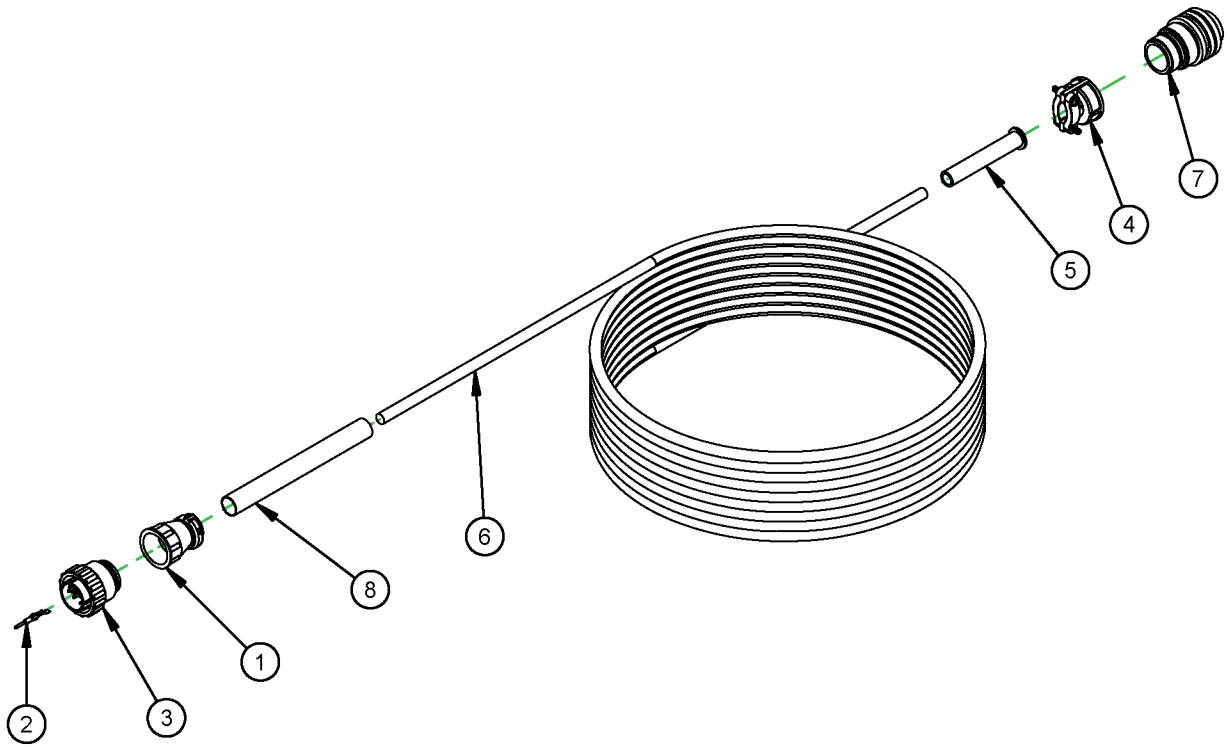
36874



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
3	1	67214	BOOT #6 RUBBER
4	1	58576	CONNECTOR PLUG 17-14 PLASTIC
5	1	67296	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD
6	1	70655	HEAT SHRINK TUBE 1/2 DIA CLEAR
7	1	69910	INSERT ESAB
8	1	69911	CONNECTOR ESAB

**CABLE ASSY POWER SUPPLY PLASTIC CONNECTORS 25  
FT EUTECTIC PULSARC 6000 OR ESAB LAI 550P**

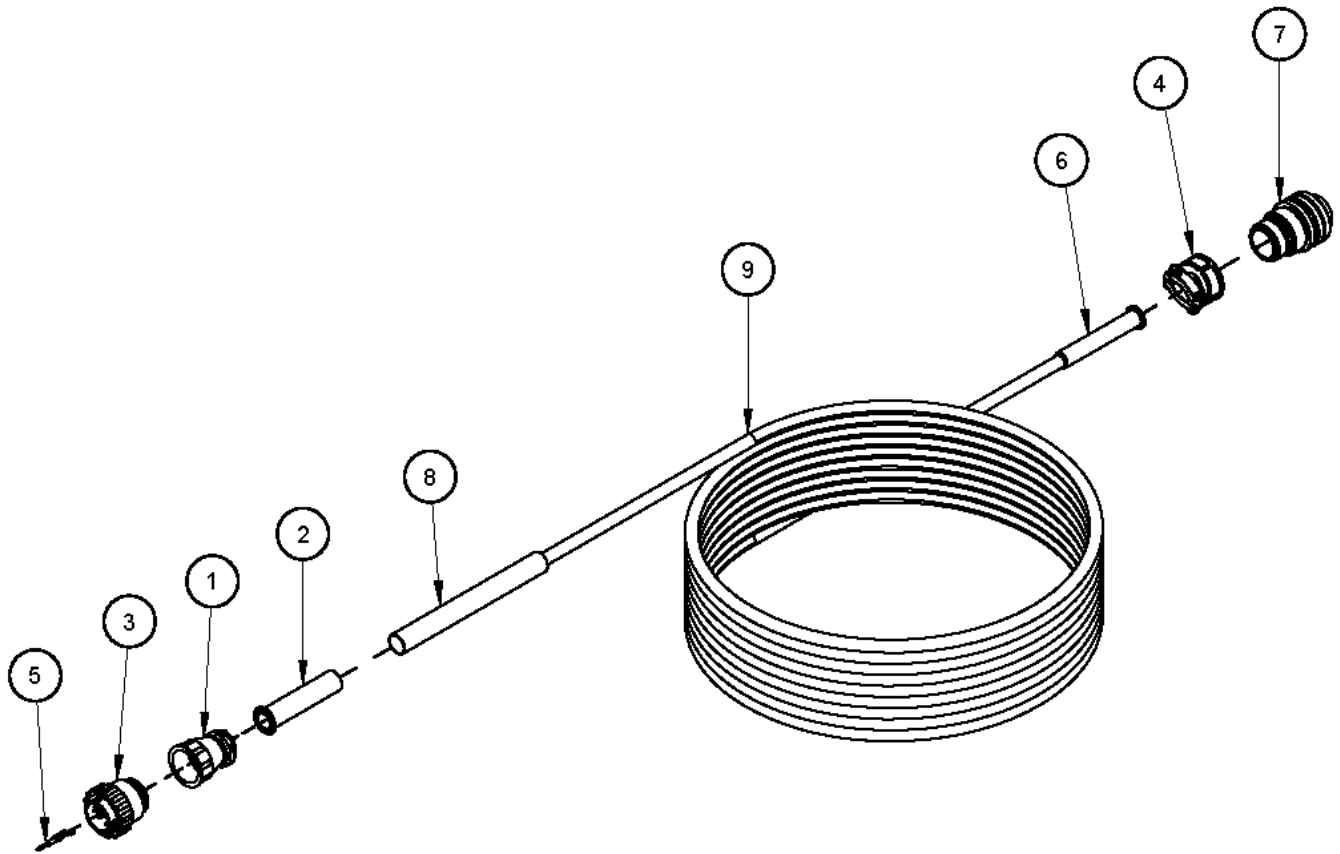
45490



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
3	1	58576	CONNECTOR PLUG 17-14 PLASTIC
4	1	67138	CONNECTOR CABLE CLAMP MS3057A SIZE 18
5	1	67214	BOOT #6 RUBBER
6	1	67296	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD
7	1	70189	CONN PLUG 10 PIN
8	1	70655	HEAT SHRINK TUBE 1/2 DIA CLEAR

CABLE ASSY POWER SUPPLY MILLER MILLERMATIC 10 PIN  
 PLASTIC CONNECTORS 25 FT

46670

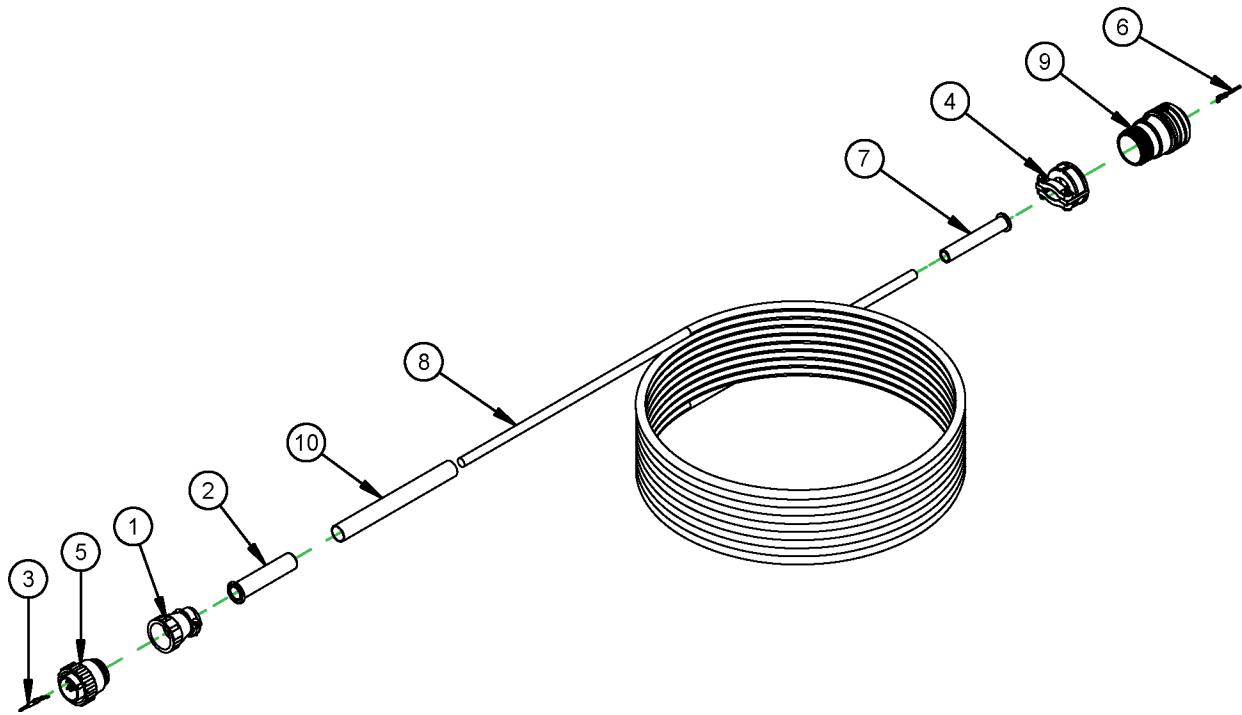


AVAILABLE CONFIGURATION

PART No	DESCRIPTION	P/N 83988 QTY
55327	CABLE ASSY POWER SUPPLY LINCOLN MULTI WELD 6 PIN PLASTIC CONNECTORS 25 FT	301"

PARTS LIST

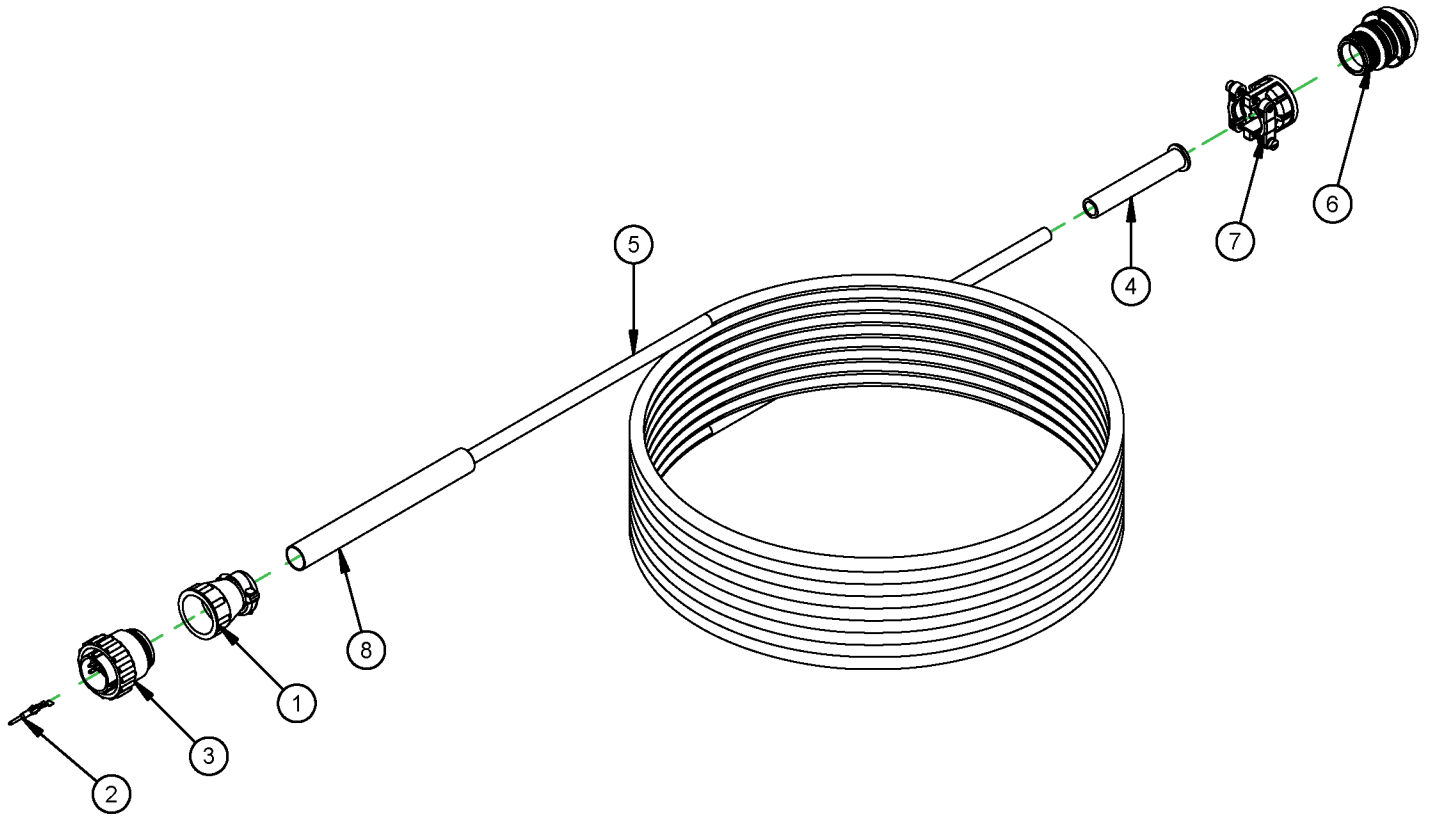
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	1	58576	CONNECTOR PLUG 17-14 PLASTIC
4	1	67138	CONNECTOR CABLE CLAMP MS3057A SIZE 18
5	7	67155	TERMINAL PIN 18-16 AWG
6	1	67214	RUBBER BUSHING FOR MS3057A CABLE CLAMP .312 ID
7	1	70259	CONN PLUG 6 PIN
8	1	70655	TUBING HEAT SHRINK .5 ID 2:1 SHRINK RATIO CLEAR
9	CHART	83988	CORD TYPE SOOW 18 AWG 5 COND 600V .325 OD UNSHIELDED GRAY JACKET



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
4	1	58480	CONNECTOR CABLE CLAMP STEP DOWN 20 TO 14 NICKEL PLATED
5	1	58576	CONNECTOR PLUG 17-14 PLASTIC
6	5	67169	CONNECTOR CRIMP PIN MALE 16-22 AWG
7	1	67214	BOOT #6 RUBBER
8	1	67296	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD
9	1	67298	CONNECTOR V300 14 PIN KEY
10	1	70655	HEAT SHRINK TUBE 1/2 DIA CLEAR

**CABLE ASSY POWER SUPPLY ESAB 350MPI 14 PIN PLASTIC  
CONNECTORS 25 FT**

69916

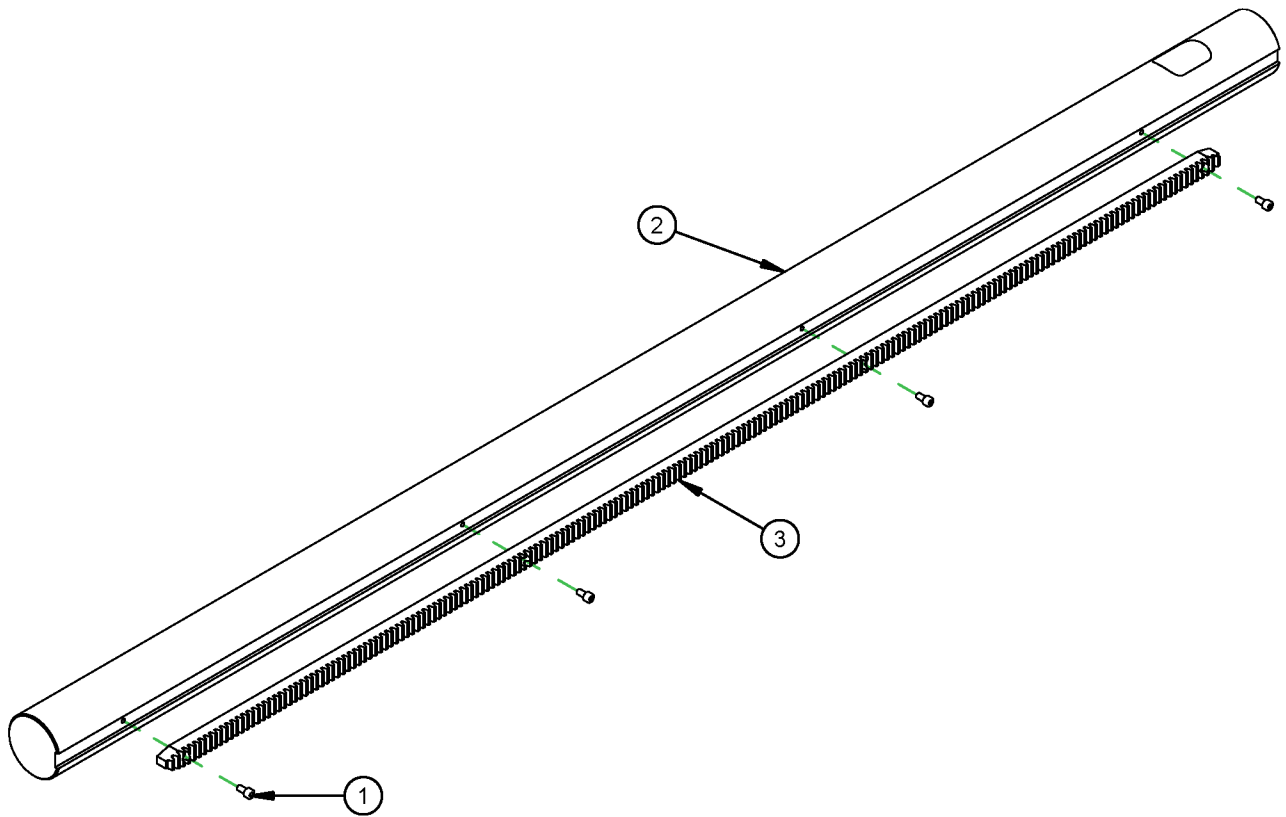


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	7	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
3	1	58576	CONNECTOR PLUG 17-14 PLASTIC
4	1	67214	BOOT #6 RUBBER
5	1	67296	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD
6	1	70294	CONN PLUG 5 PIN
7	1	70295	CLAMP CONN PLUG 5 PIN
8	5in	70655	HEAT SHRINK TUBE 1/2 DIA CLEAR

CABLE ASSY POWER SUPPLY MILLER DELTAWELD 5 PIN  
 PLASTIC CONNECTORS 25 FT

69918

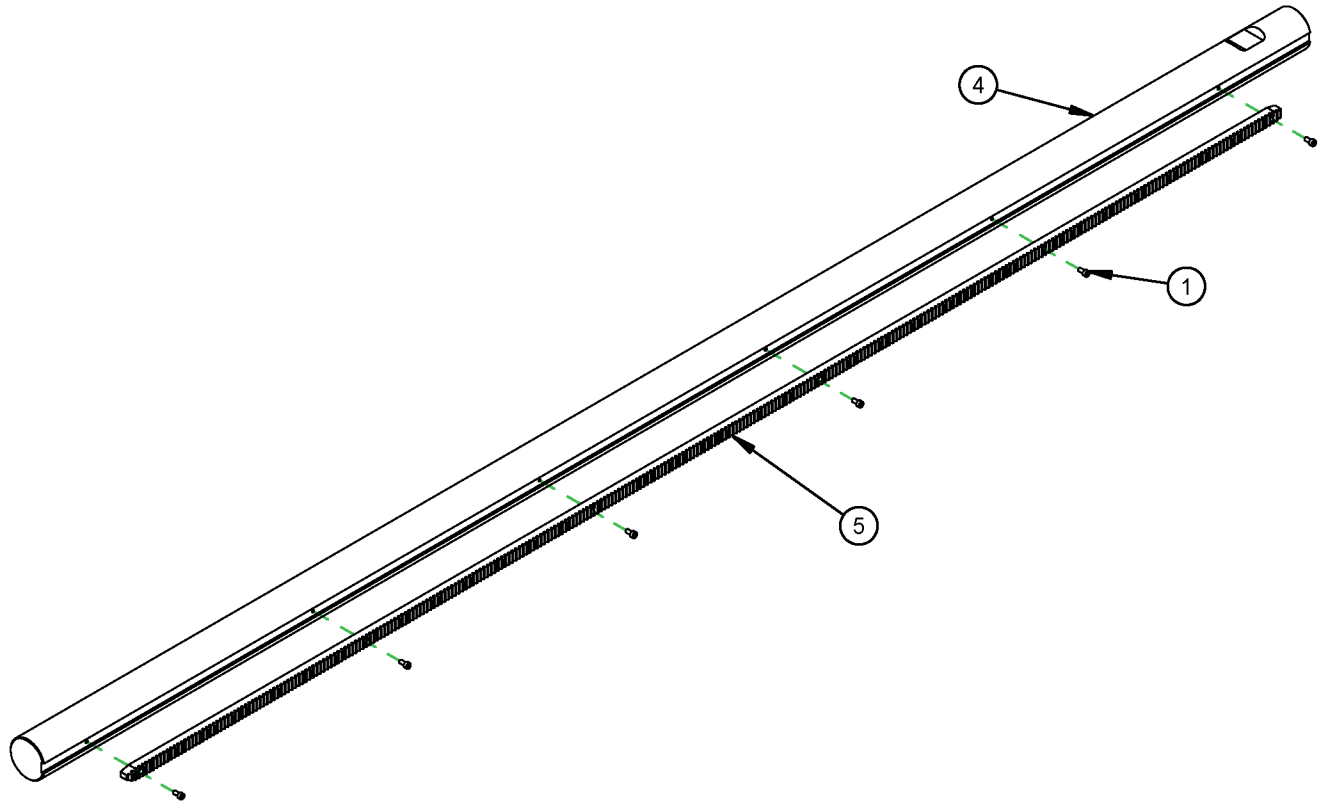




PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	30828	SCREW 5-40 X 1/4 SHCS
2	1	67513	ROD GUIDE 30 IN TRAVEL AUX SLIDE
3	1	67520	RACK AUX STEP ASSY 30 IN

## ASSY GUIDE AUXILIARY SLIDE

70103

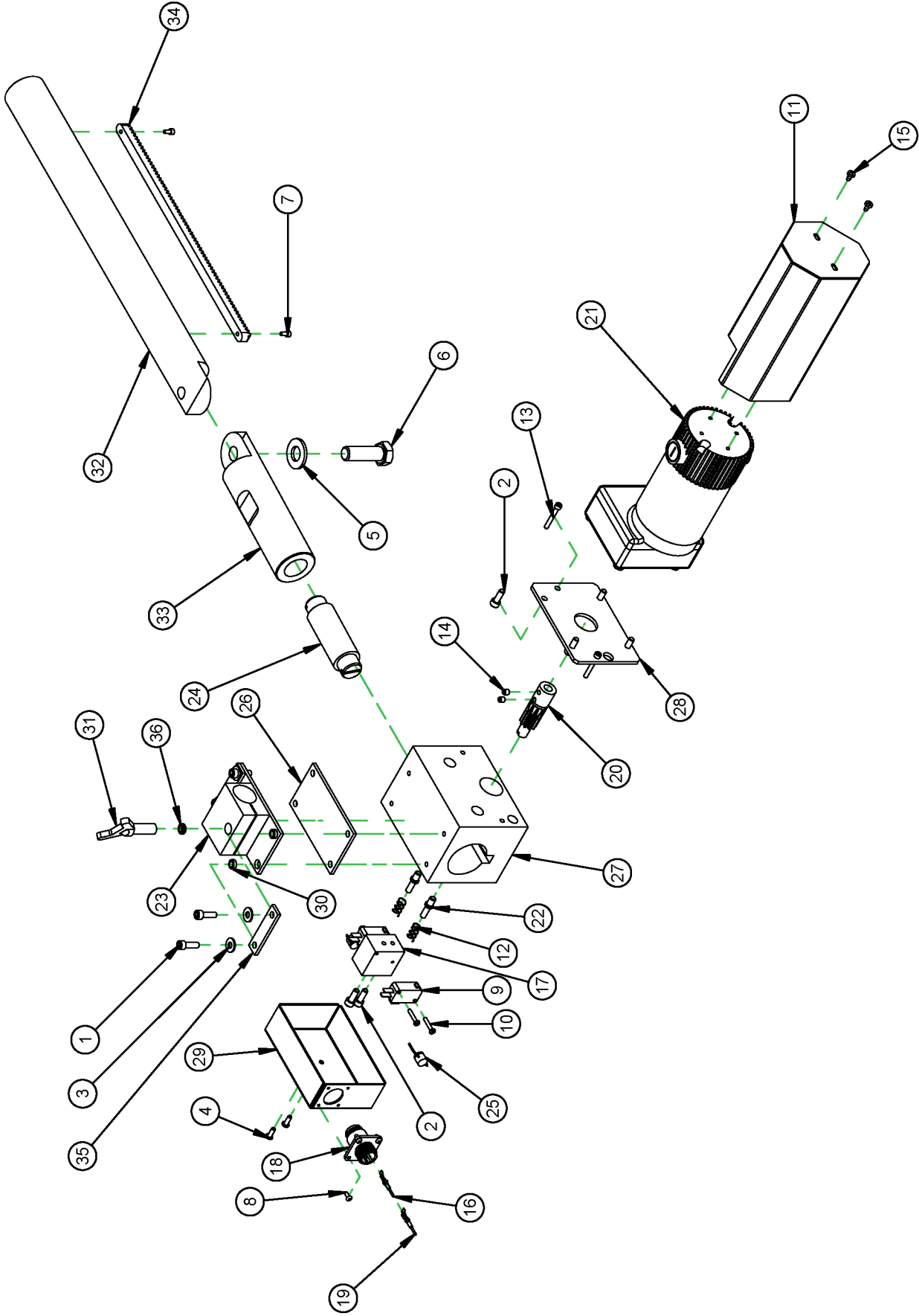


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	30828	SCREW 5-40 X 1/4 SHCS
4	1	67514	ROD GUIDE 50 IN TRAVEL AUX SLIDE
5	1	67521	RACK AUX STEP ASSY 50 IN (KB)

ASSY GUIDE AUXILIARY SLIDE 50 IN TRAVEL

70104

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CONICAL SEAT STEP MECHANISM AUX 10 INCH STROKE

70193

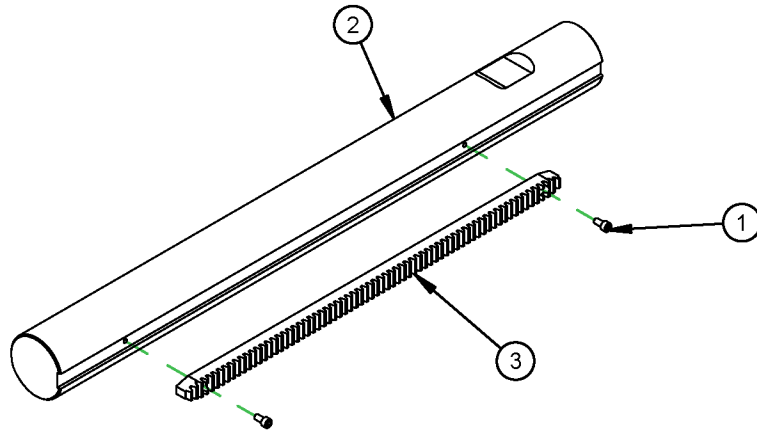


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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10157	SCREW 10-32 X 5/8 SHCS
2	6	10877	SCREW 10-32 X .5 SHCS
3	4	11315	WASHER #10 FLTW
4	2	11677	SCREW 6-32 X 3/8 BHSCS
5	1	11779	WASHER 1/2 FLTW SAE
6	1	15893	SCREW 1/2-13 X 1-1/2 HHCS
7	2	30828	SCREW 5-40 X 1/4 SHCS
8	4	37397	SCREW 4-40 X 1/4 BHSCS
9	2	37408	SWITCH LIMIT QUILL
10	4	40559	SCREW 4-40 X 5/8 SPHMS
11	1	40565	SHROUD MOTOR ROTATION
12	2	40583	SPRING COMP .30 OD X .022 WIRE X .625 LONG
13	2	40585	SCREW 6 - 32 X 1 SHCS
14	2	44800	SCREW 10-32 X 3/8 SSSFP
15	2	48582	SCREW 6-32 X 1/4 PPHSTS SELF TAPPING BLACK OXIDE
16	2	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
17	1	66977	BLOCK MTG TRAVEL LIMIT
18	1	67063	CONNECTOR PLUG 11-4 PLASTIC
19	2	67155	TERMINAL PIN 18-16 AWG
20	1	67157	PINION RADIAL FACING SLIDE
21	1	67190	GEARMOTOR PAINTED BW3000 90 VDC 11 RPM TENV
22	2	67343	FEELER RACK LIMIT
23	1	67419	SUPPORT LG TORCH ROD BLOCK
24	1	67421	CONNECTOR ROD RADIAL
25	2	67451	DIODE 200V 6A
26	1	67463	INSULATOR TORCH BLOCK
27	1	67470	SLIDE FACING RADIAL
28	1	67472	SLIDE MOTOR PLATE RADIAL
29	1	67473	COVER RADIAL FACING SLIDE
30	4	67584	BUSHING INSULATOR
31	1	67678	SCREW 3/8-16 X 1 WING THUMB
32	1	68112	BAR RADIAL FACING SLIDE
33	1	68113	P KNUCKLE RADIAL FACING SLIDE
34	1	68114	RACK RADIAL FACING SLIDE
35	2	68188	STRIP ISOLATION
36	1	70203	WASHER FIBER .203 ID TOPHAT

## CONICAL SEAT STEP MECHANISM AUX 10 INCH STROKE

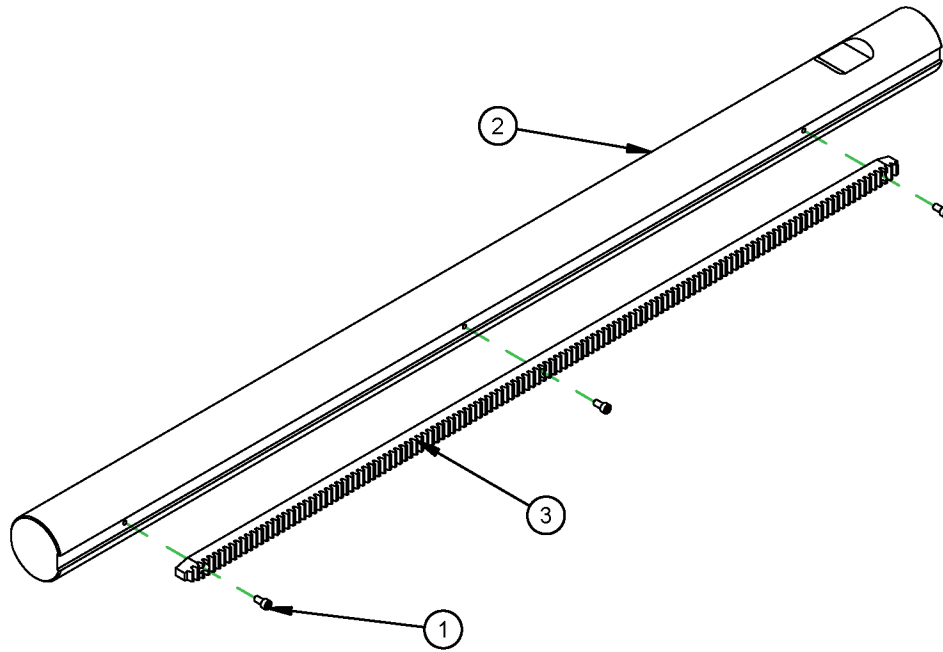
70193



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	30828	SCREW 5-40 X 1/4 SHCS
2	1	68155	ROD GUIDE AUX SLIDE 10 IN TRAVEL
3	1	68162	SP RACK AUX STEP ASMB 10

ASSY GUIDE AUXILIARY SLIDE 10 IN TRAVEL

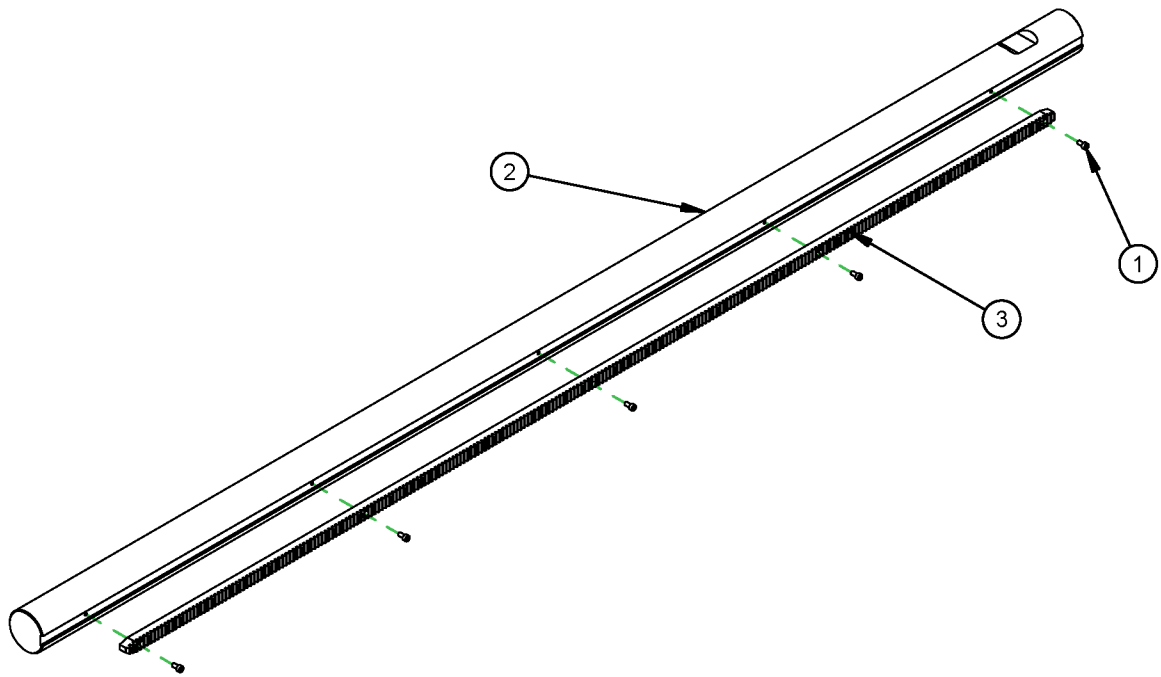
70427



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	30828	SCREW 5-40 X 1/4 SHCS
2	1	68158	SP ROD GUIDE AUX SLIDE 20 IN TRAVEL
3	1	68164	SP RACK AUX STEP ASMB 20

ASSY GUIDE AUXILIARY SLIDE 20 IN TRAVEL

70428

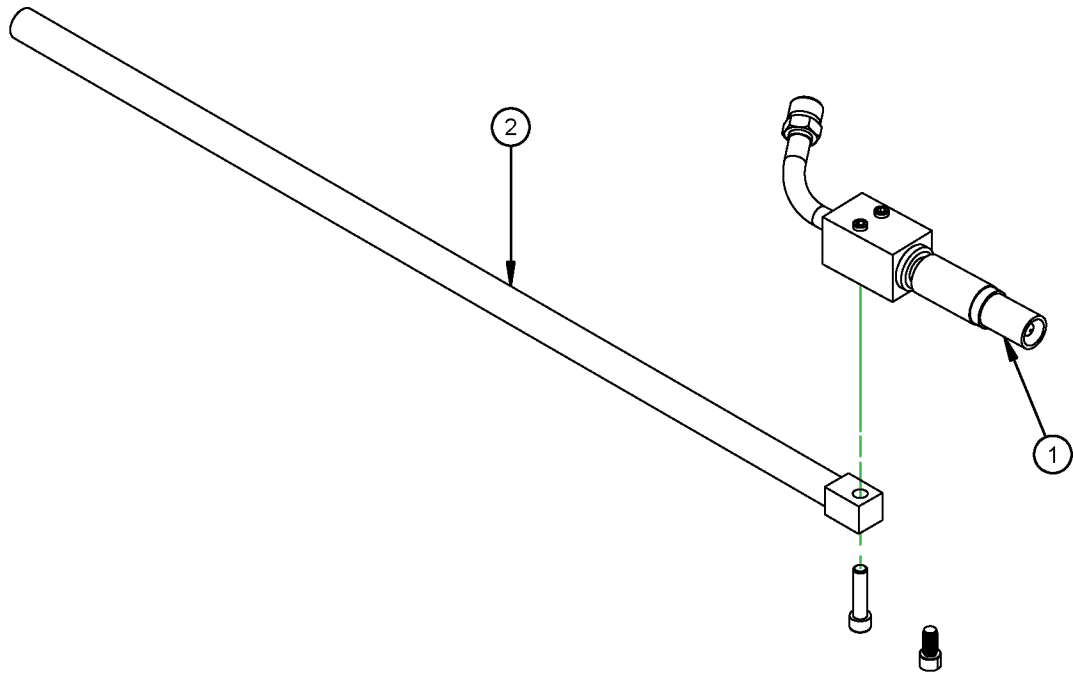


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	3	30828	SCREW 5-40 X 1/4 SHCS
2	1	68159	ROD GUIDE AUX SLIDE 40 IN TRAVEL
3	1	68165	SP RACK AUX STEP ASMB 40

ASSY GUIDE AUXILIARY SLIDE 40 IN TRAVEL

70429

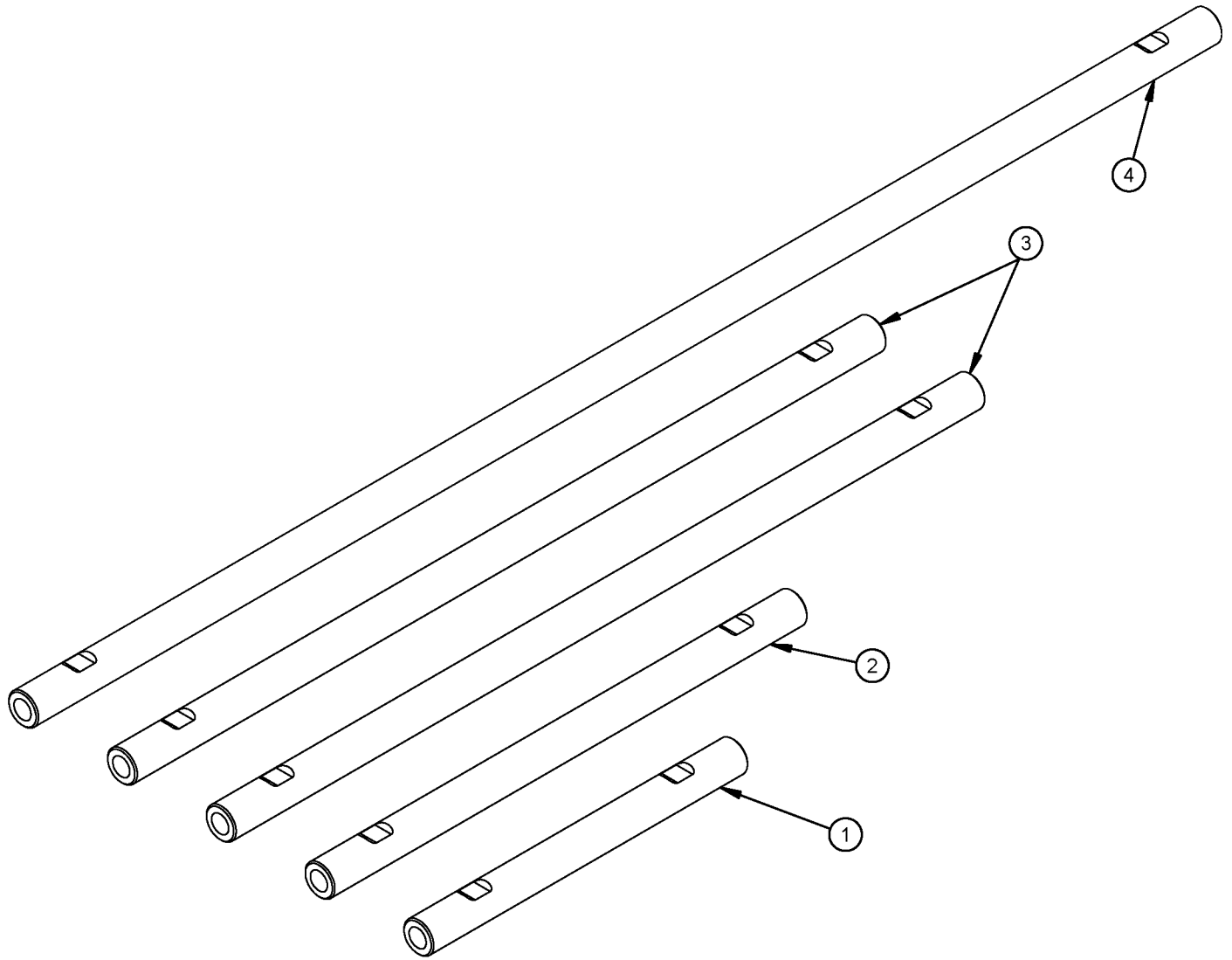




PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	70125	TORCH SMALL BORE COMPACT
2	1	70194	SUPPORT 30"/760mm TORCH

KIT SMALL BORE TORCH 12 - 24 IN ID BW5000

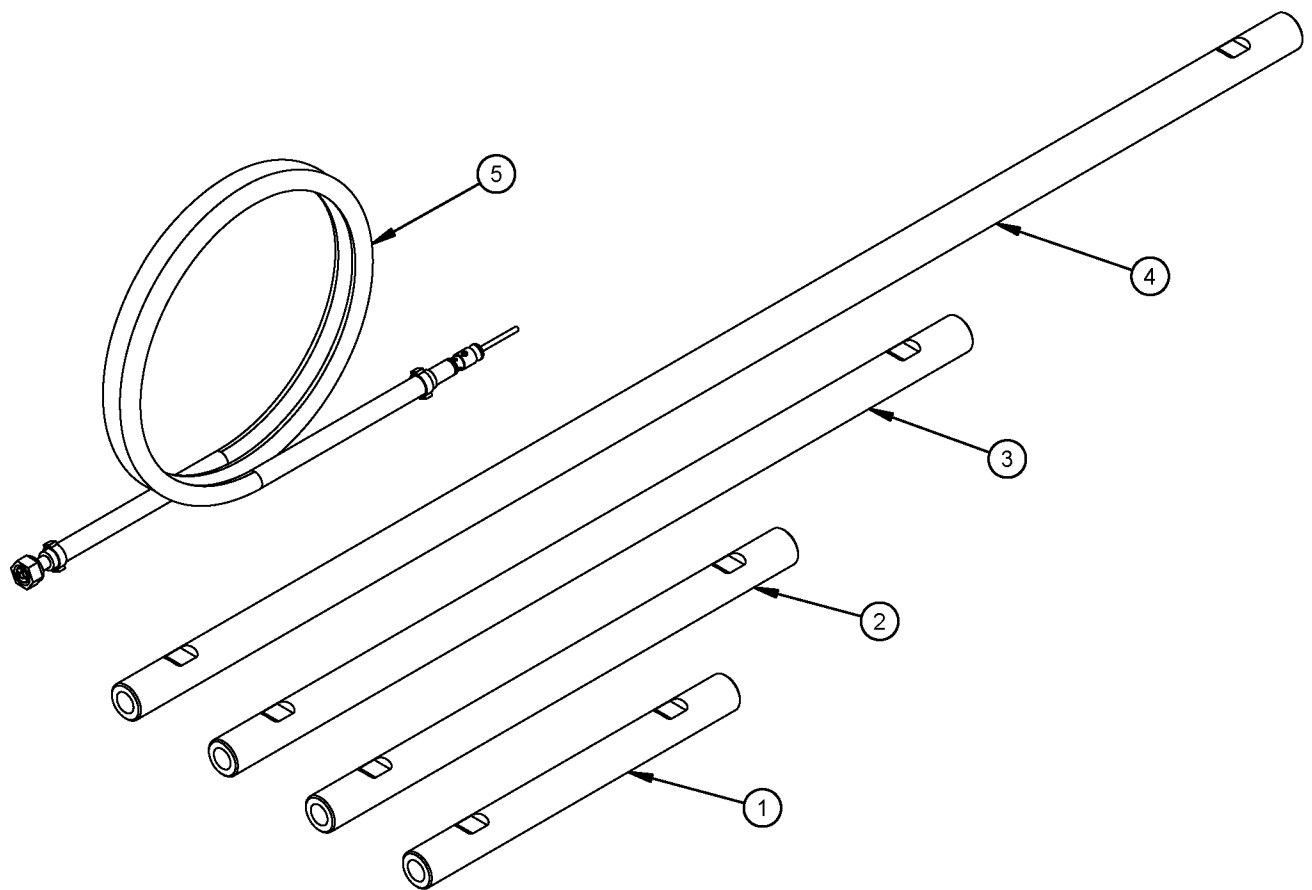
71988



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67522	ROD RADIAL PLAIN 16 IN
2	1	67523	ROD RADIAL PLAIN 24 IN
3	2	67524	ROD RADIAL PLAIN 38 IN
4	1	67525	ROD RADIAL PLAIN 60 IN

KIT RADIAL RODS BW5000 RANGE 24 - 120 ID / 24 - 96 OD

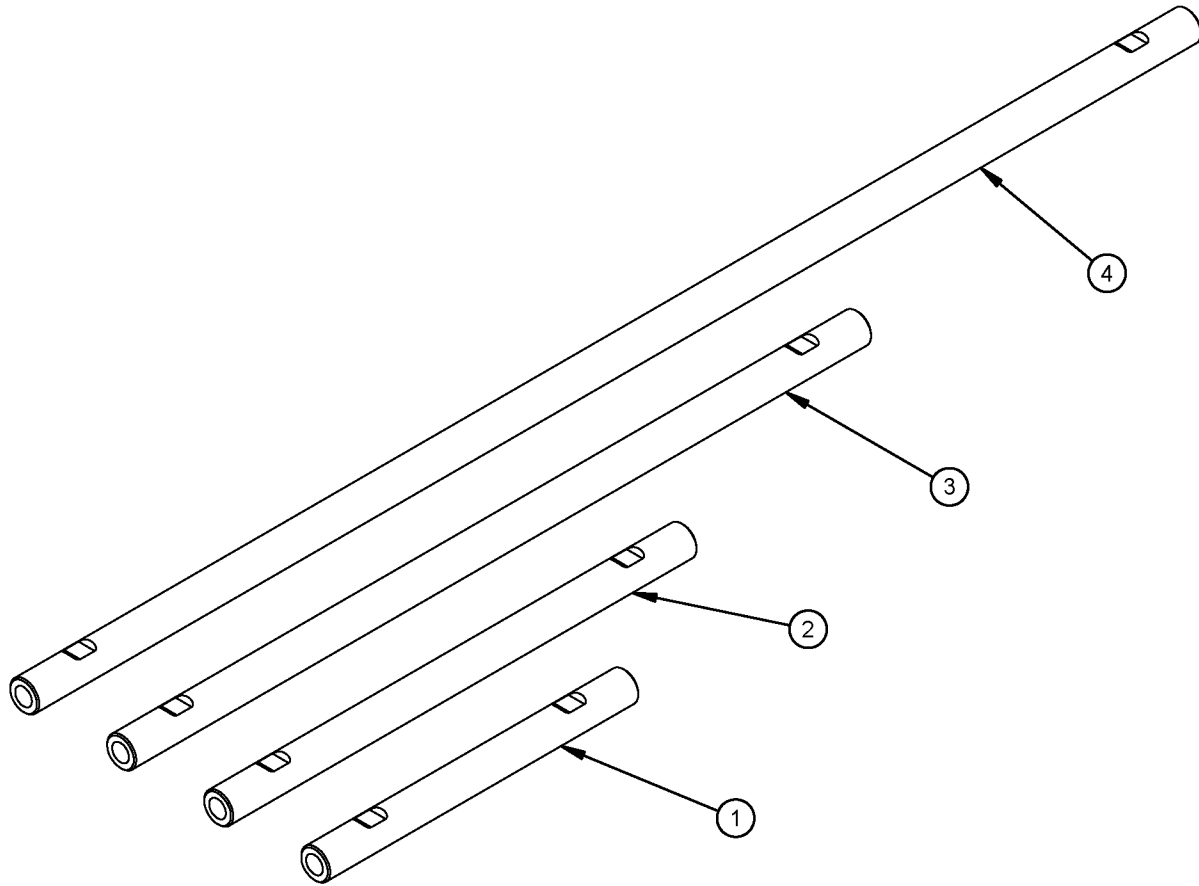
71989



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67522	ROD RADIAL PLAIN 16 IN
2	1	67523	ROD RADIAL PLAIN 24 IN
3	1	67524	ROD RADIAL PLAIN 38 IN
4	1	67525	ROD RADIAL PLAIN 60 IN
5	1	72014	CONDUIT 96" WIRE FEED

KIT RADIAL RODS BW5000 RANGE 24 - 144 ID / 24 - 120 OD

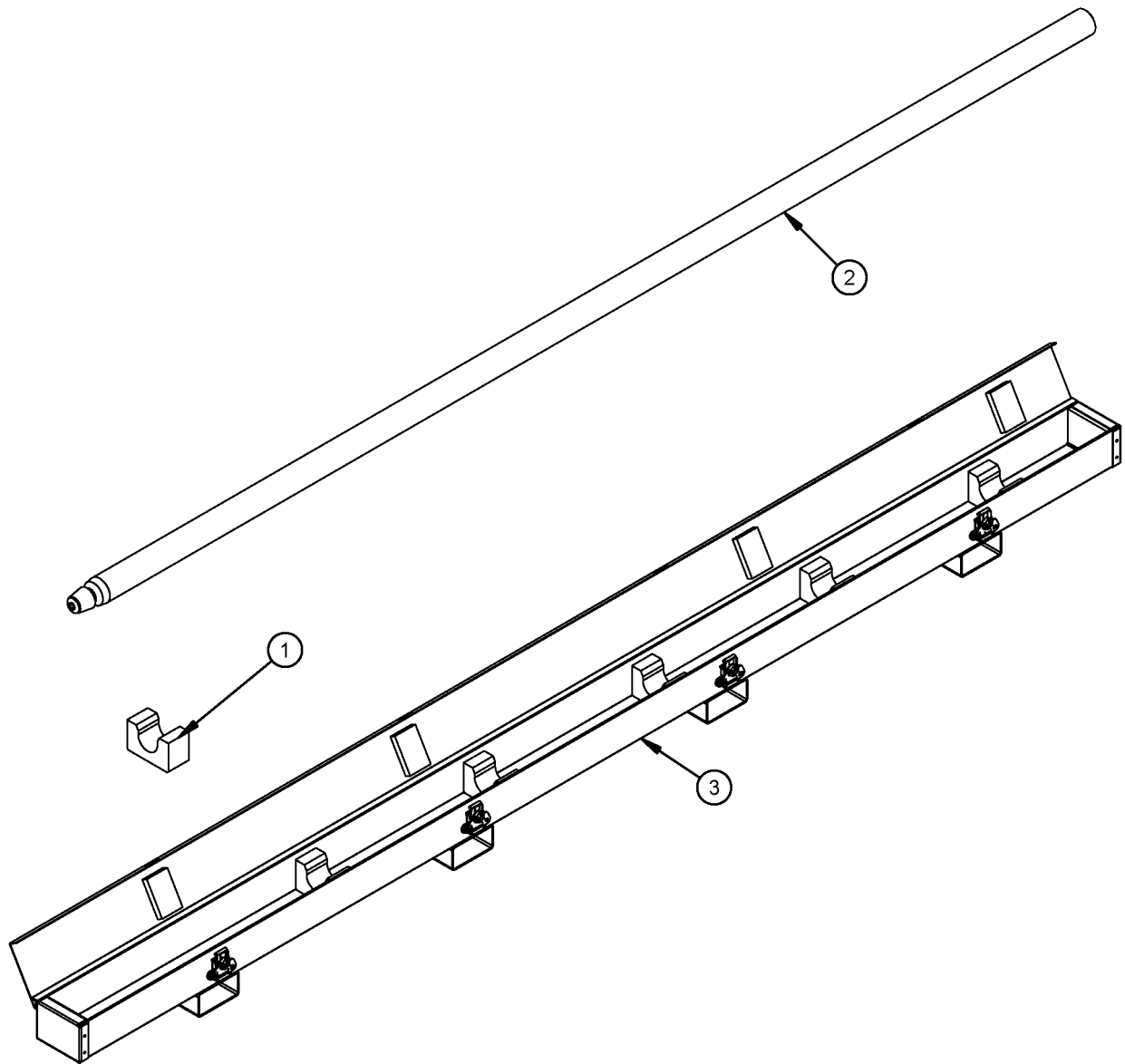
71990



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67522	ROD RADIAL PLAIN 16 IN
2	1	67523	ROD RADIAL PLAIN 24 IN
3	1	67524	ROD RADIAL PLAIN 38 IN
4	1	67525	ROD RADIAL PLAIN 60 IN

KIT RADIAL RODS BW5000 RANGE 24 - 120 ID / 24 - 96 OD

72068



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	6	38263	INSERT FOAM 1-3/4 BORING BAR SADDLE
2	1	68169	BAR LINE 96 IN KEYLESS
3	1	72548	CONTAINER SHIPPING BORING BAR 99" LONG METAL

BAR LINE 96 INCH KEYLESS W/ CRATE

72071

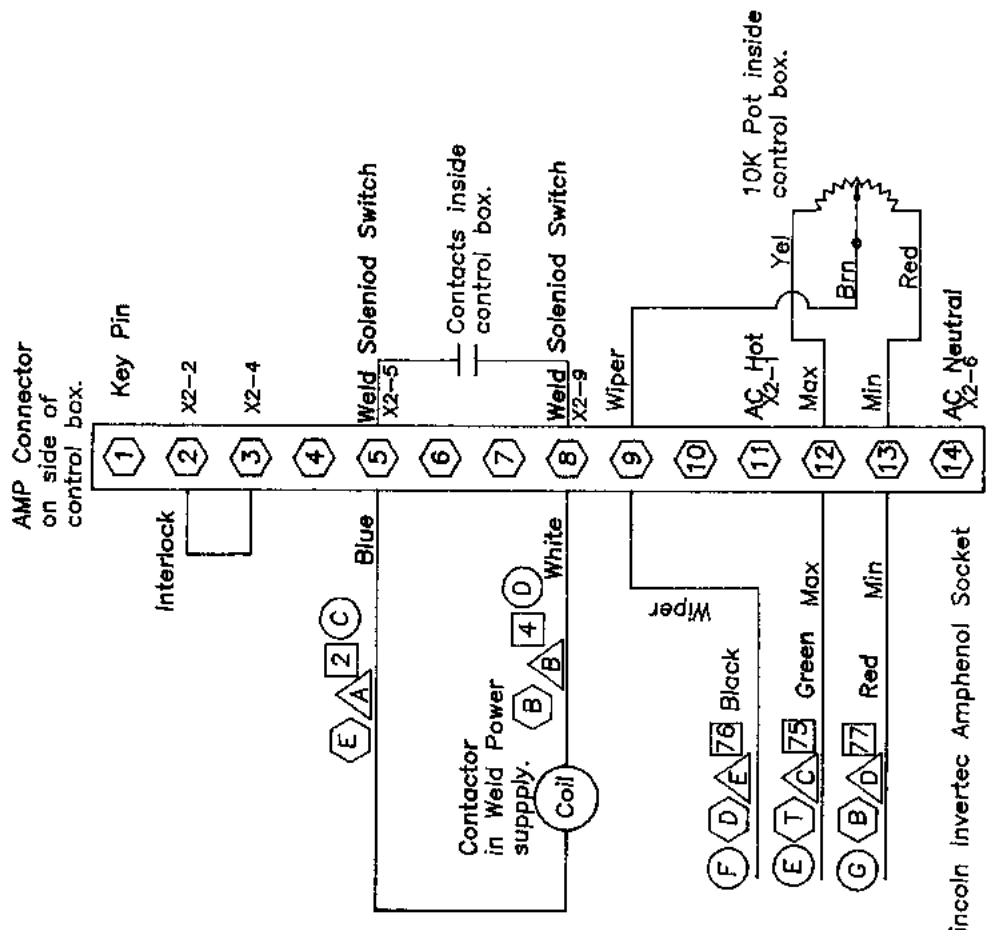
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Power Supply Cable A-1061

AMP Connector Style

Power Supply Provides Contactor Current

(most common style)



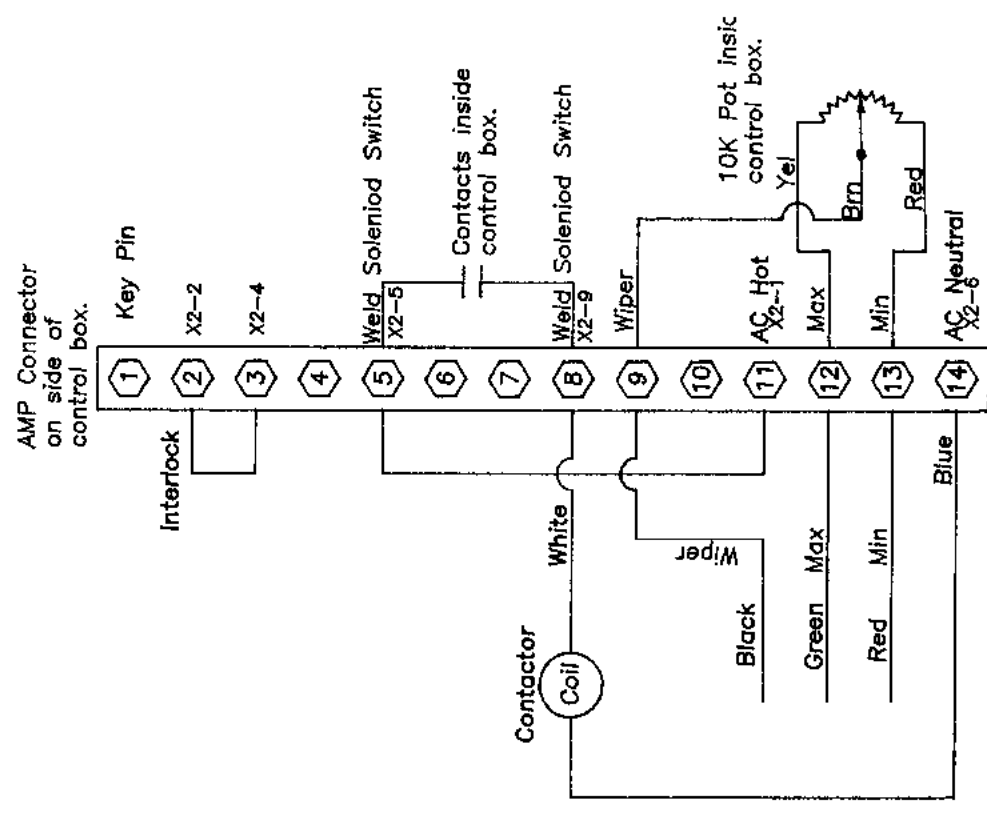
- = Lincoln Invertec Amphenol Socket
- △ = Miller XMT Amphenol Socket
- = Lincoln DC400-DC600
- ◇ = PowCon 300 MST Amphenol

Power Supply Cable A-1063

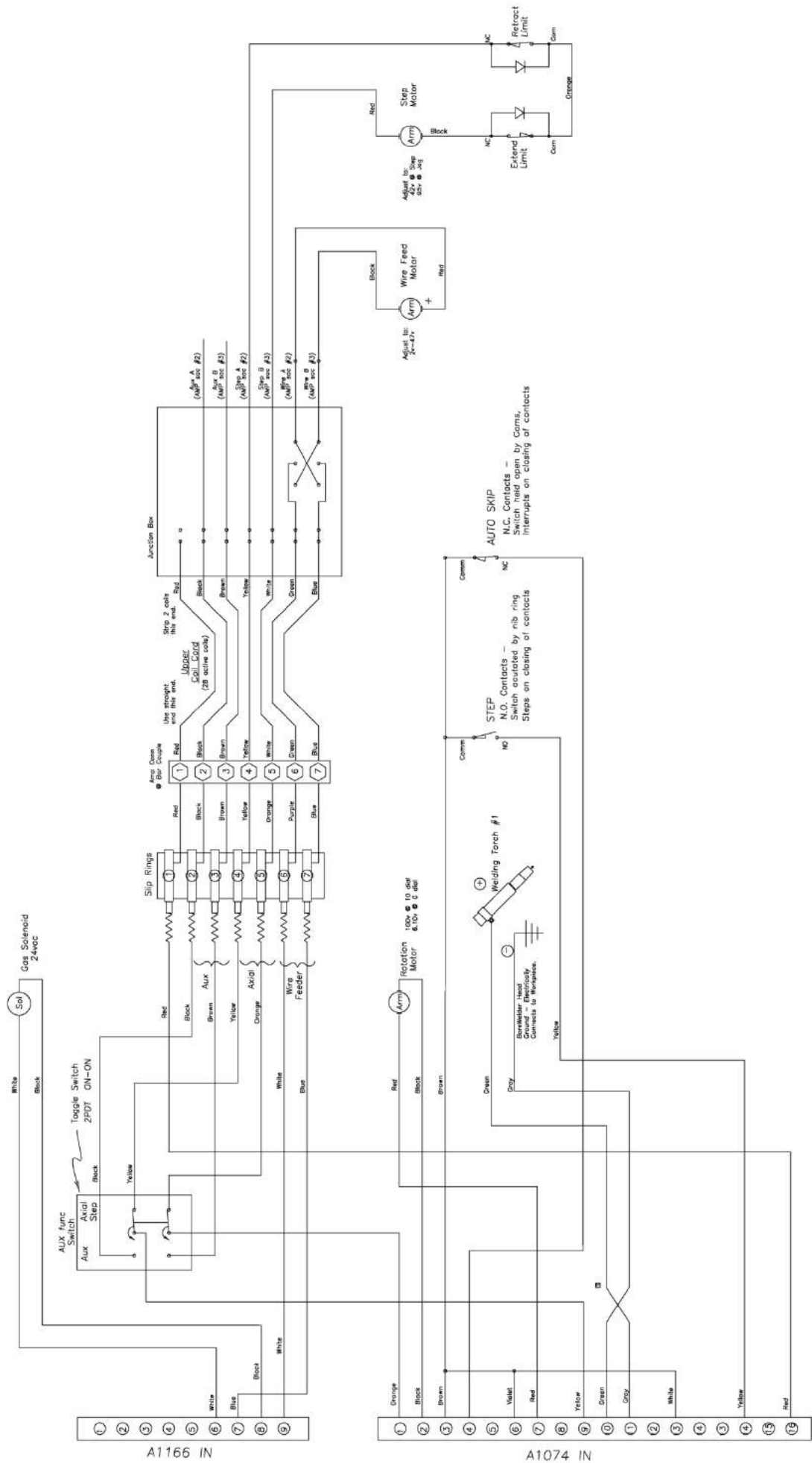
AMP Connector Style

Control Provides Contactor Current

(rather rare)



# BOREWELDER CIRCUIT 24 VOLT SOLENOID





## Quick Reference Charts

		TRAVEL SPEED (INCHES PER MINUTE) IPM						
		10	15	20	25	30	35	40
DIAMETER (INCHES)	20	376.80	251.20	188.40	150.72	125.60	107.66	94.20
	25	471.00	314.00	235.50	188.40	157.00	134.57	117.75
	30	565.20	376.80	282.60	226.08	188.40	161.49	141.30
	35	659.40	439.60	329.70	263.76	219.80	188.40	164.85
	40	753.60	502.40	376.80	301.44	251.20	215.31	188.40
	45	847.80	565.20	423.90	339.12	282.60	242.23	211.95
	50	942.00	628.00	471.00	376.80	314.00	269.14	235.50
	55	1036.20	690.80	518.10	414.48	345.40	296.06	259.05
	60	1130.40	753.60	565.20	452.16	376.80	322.97	282.60
	65	1224.60	816.40	612.30	489.84	408.20	349.89	306.15
	70	1318.80	879.20	659.40	527.52	439.60	376.80	329.70
	75	1413.00	942.00	706.50	565.20	471.00	403.71	353.25
	80	1507.20	1004.80	753.60	602.88	502.40	430.63	376.80
	85	1601.40	1067.60	800.70	640.56	533.80	457.54	400.35
	90	1695.60	1130.40	847.80	678.24	565.20	484.46	423.90
	95	1789.80	1193.20	894.90	715.92	596.60	511.37	447.45
	100	1884.00	1256.00	942.00	753.60	628.00	538.29	471.00
	105	1978.20	1318.80	989.10	791.28	659.40	565.20	494.55
	110	2072.40	1381.60	1036.20	828.96	690.80	592.11	518.10
	115.0	2166.60	1444.40	1083.30	866.64	722.20	619.03	541.65
120	2260.80	1507.20	1130.40	904.32	753.60	645.94	565.20	
125.0	2355.00	1570.00	1177.50	942.00	785.00	672.86	588.75	
130	2449.20	1632.80	1224.60	979.68	816.40	699.77	612.30	
135.0	2543.40	1695.60	1271.70	1017.36	847.80	726.69	635.85	
140	2637.60	1758.40	1318.80	1055.04	879.20	753.60	659.40	
145.0	2731.80	1821.20	1365.90	1092.72	910.60	780.51	682.95	

**SECONDS PER ROTATION**

STEP SIZE CHART	
DIAL SETTING	STEP SIZE (inches)
0	0.016"
1	0.04"
2	0.069"
3	0.097"
4	0.120"
5	0.148"
6	0.175"
7	0.200"
8	0.228"
9	0.253"
10	0.263"

ROTATION SPEED CHART	
DIAL SETTING	SECONDS PER REVOLUTION
0	2370 SPR
1	1896 SPR
2	1362 SPR
3	770 SPR
4	472 SPR
5	280 SPR
6	194 SPR
7	130 SPR
8	94 SPR
9	76 SPR
10	69 SPR

TRAVEL SPEED CONSTANTS		
INCHES PER MINUTE (IPM) TRAVEL SPEED	SECONDS PER INCH OF DIAMETER	SECONDS TO TRAVEL ONE LINEAR INCH
10 IPM	18.84	6 seconds
12 IPM	15.7	5 seconds
14 IPM	13.4	4.3 seconds
16 IPM	11.7	3.75 seconds
18 IPM	10.4	3.3 seconds
20 IPM	9.4	3 seconds
22 IPM	8.4	2.7 seconds
24 IPM	7.8	2.5 seconds

AMPERAGE VS. WIRESPEED APPROXIMATE VALUES (GMAW SOLID WIRE)			
IPM WIRESPEED	.035 DIA. WIRE	.045 DIA. WIRE	.062 DIA. WIRE
100 IPM	59 AMPS	97 AMPS	185 AMPS
150 IPM	90 AMPS	150 AMPS	275 AMPS
200 IPM	114 AMPS	189 AMPS	350 AMPS
250 IPM	130 AMPS	215 AMPS	410 AMPS
300 IPM	140 AMPS	230 AMPS	440 AMPS
350 IPM	160 AMPS	265 AMPS	490 AMPS
400 IPM	180 AMPS	300 AMPS	560 AMPS





 **CLIMAX**

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 **BORTECH**  **CALDER** **H&S** **TOOL**